

PC MAGAZINE

VOLUME 6 NUMBER 20
NOVEMBER 24, 1987

STARTING THIS ISSUE:
POWER PROGRAMMING, HOT
NEW COLUMN BY RAY DUNCAN

California Dreamin': **Apple Takes On IBM**



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■ Sharper Images:
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Black-on-White
Monitors for
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Publishing

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From and For
Heavy Hitters



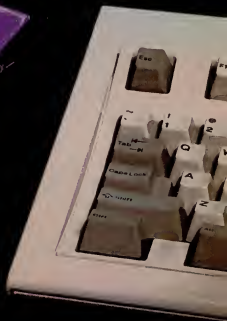
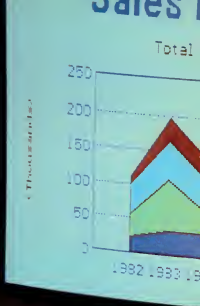
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Division 5	0.00	42,000.00
Division 6	0.00	124,048.00
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	Integrated Graph Printing	YES	NO
	Full Graph Customization	YES	NO
	On-Screen Font Styles	11	1
	PostScript Support	YES	NO
VERSATILITY	User-modifiable Menus	YES	NO
	Menu Shortcuts	YES	NO
	Pull-down menus	YES	NO
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And speaking of more space, since there's room on the system board for an extra megabyte of RAM, memory expansion doesn't have to mean fewer available expansion slots.

Soup Them Up.

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Specifications

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- 1.2-MB, 5 1/4-inch floppy disk drive;
- 3 1/2-inch drives optional
- Two serial and two parallel ports
- Phoenix BIOS
- Optional EMS software
- Eight expansion slots
- Floormount configuration
- 101-key keyboard
- Shown with optional graphics adapter and monitor

ALR 386/2 R66 \$3490

- ALR-designed multilayer system board
- 80386-16 microprocessor, 20-MHz CPU speed optional
- Socketed for 80287 and 80387 support
- 1 MB 32-bit, 80-ns RAM, expandable to 2 MB on system board
- 66-MB, 28-ms hard disk drive
- 1 serial, 1 parallel port
- Phoenix BIOS
- 32-bit control software; Vdisk, disk caching, EMS and EEMS (optional)
- 1.2-MB, 5 1/4-inch floppy disk drive;
- 3 1/2-inch drives optional
- Eight expansion slots
- Floormount configuration
- 101-key keyboard
- Shown with optional graphics adapter and monitor



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	ALR Dart R66	ALR 386/2 R66	IBM PS/2 Model 60	AST Premium/286 Model 140
Price	\$2295	\$3490	\$5295	\$3495
Microprocessor	10-MHz 80286	10-MHz 80386	10-MHz 80286	10-MHz 80286
Hard disk	66 MB, 28 ms	66 MB, 28 ms	44 MB, 40 ms	44 MB, 28 ms
Data transfer rate	390 KB/s	390 KB/s	255 KB/s	255 KB/s
Interleaving	1:1	1:1	1:1	2:1
RAM	1 MB, expandable to 2 MB on system board	1 MB, expandable to 2 MB on system board	1 MB	1 MB
Coprocessor support	80287	80287 and 80387	80287	80287
Serial/parallel ports	2/2	1/1	1/1	1/1

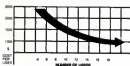
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Turn a Small Budget Into a Powerful 32bit 386 Business Network

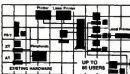
The growing business needs the power and efficiency of a Multi-user Network system to tie together its ever-increasing computing needs. But most Network solutions create other problems—the price, installation, support and compatibility problems. But Advanced Logic Research offers a real solution.

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The GENESYS SOLUTION keeps saving you money as you add users.



The GENESYS SOLUTION is expandable to 60 users and accommodates the PC, hard disk and peripherals you already own.



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adding on as your business grows and you'll see that the GENESYS SOLUTION keeps saving you money.

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WHAT'S INSIDE

We all know contributing editor Jim Seymour as a longtime PC user and arbiter of taste in the DOS world. In his column, he doles out praise and censure with equal grace, unearthly little-known hardware and software gems, warning readers against lemons, and exploring computing issues.

But Seymour's also an avid—and longtime—Mac user.

"Like so many others, I got one of those early 128K, one-floppy-disk Macs," he says, "and almost immediately fell into a love-hate relationship with it: love, because the graphical interface gave promise of big things to come; hate, because those big things took forever to appear."

"My 128K Mac grew into a two-floppy, then two-floppy-plus-hard-disk 512K Enhanced machine, and when the 'good stuff' hit about a year and a half ago, the machine finally began to make the metamorphosis from Yuppie totem to business computer."

"The Mac II fundamentally changes the equation for both Apple and IBM—and for business users of PCs," says Seymour. "The Mac II's speed and power put it on a more or less equal footing with the high-end IBM-compatible machines. And the graphical approach of most Mac software makes the machine a better choice for a lot of jobs."

With its fast processor, hi-res graphics, and growing business software library, the Mac II is a formidable sparring partner for IBM's top-of-the-line PS/2 Model 80. That's why we had Seymour put them



Columnist Jim Seymour with the dynamic duo that duke it out in this year's cover story. True Blue meets full zoot fruit, page 92.

head-to-head in our cover story, which begins on page 92. Along with his in-depth review and point-by-point comparison, you'll find a historical overview by another of our more-outspoken columnists, John C. Dvorak. In his inimitable style, Dvorak recaps 10 years of IBM/Apple seesawing and gives some insight into two very different philosophies.

While both writers agree that the Mac is now ready for the big leagues, Seymour bemoans the innocence it lost on the way to sophistication. "The Mac isn't all that easy to buy and learn to use anymore," he says. "A very small voice within me yells for the good old days when you could have any color Mac you wanted, as long as it was tan and came with Steve Jobs' choice of monitor, drive, and keyboard. But that voice is silenced quickly by the satisfaction I get from driving a Mac II, a Lambo instead of the Yugo that was the original Mac. But the price of that satisfaction is a long list of tough questions. And a deep dip into the savings account."

As the story says, "Toto, I've been feeling we're not in Kansas anymore."

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Cover Photograph:
Roberto Brosan
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Take two: Apple and IBM are at it again with the Mac II and PS/2 Model 80, hot contenders for the power user's dollar.



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ISAAC ASIMOV



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A: Well, let's see. In July I had two books published: "The Best Science Fiction of Isaac Asimov." This October will see the fifth in my *Foundation* series,

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LETTERS TO PC MAGAZINE



BUSINESS SOFTWARE SURVEY

I would like to tip my hat to your outstanding feature articles on business software ("Making Every Number Count," *PC Magazine*, Volume 6 Number 15). I have been waiting a long time for an in-depth analysis of low-end to high-end accounting modules. Your well-written and well-organized articles will be an invaluable help in furthering my business horizon.

Adrian Pharo
Morehead City, North Carolina

I had never kissed a magazine before, but after reading your last issue, I made an exception ("Making Every Number Count"). I had been searching for a dBASE III-compatible accounting system, with no luck. Then your magazine came with reviews of five accounting packages that were just what I was looking for. It could not have been more timely!

Karen Keyes
Harpers Ferry, West Virginia

I found your article on microcomputer-based accounting software to be thorough and informative ("Making Every Number Count"). However, in the Editor's Choice box, you make this cryptic remark with regard to *Solomon III*: "... *Solomon III*, made by T.L.B., outdistances the competition unless you expect to go from a single-user to a multiuser system."

Since many organizations that are in need of high-powered accounting software will ultimately need to network that appli-

cation, it is important to understand the meaning of this remark. Are you saying that *Solomon* is difficult to upgrade from single-user to multiuser, or are you saying it does not run as well on a network? I know that networking does not suggest itself intuitively in a discussion of accounting software, but my experience tells me it is of vital concern.

David F. Russo
College Park, Maryland

If you're now running single-user PCs, and you plan to keep it that way, Solomon III excels. Ditto if you plan to install an accounting system from scratch on a multiuser system. But if you want to install accounting software on standalone PCs today and plan to network them in the future, Solomon III may make your life miserable during the transition period. As stated in the Editor's Choice box, the transition with Macola is much less painful. And accounting is one activity that clearly benefits from networking.—Bill Howard

When our volunteer fire department needed to upgrade our bookkeeping procedures, we began looking for an automated system for the organization. Finding no suitable commercial software package and not wishing to start from scratch, we contracted for a customized software package. Now, after 3 years of continuous development by the vendor and myself, the system is functional and meeting our requirements. However, this development required us to ignore most of the points in the sidebar "Building a Successful System," and to break most of "The Twelve Commandments" ("Making Every Number Count").

I feel that our accounting software

needs are not unique for a nonprofit organization and that these needs are still ignored by the vendors of the systems you reviewed.

Roland A. Leathrum
Newark, Delaware

In his review of *PRO-IV Accountant*, Claude Bartel noted that he was stumped by the error message "Report not genned" ("Making Every Number Count"). I believe I can help (with tongue in cheek). Although I am a novice, I have found that you can understand the most cryptic error messages if you paraphrase them. In this case the answer is so simple I am surprised Mr. Bartel didn't figure it out himself: "Gen your reports, Claude."

P. Alfieri-Jones
Challis, Idaho

According to Applications Systems Corp., "genning" is a term used with PRO-IV to mean compiled or generated.—Ed.

I was disappointed by the Price Waterhouse review of *NewViews* in your accounting issue ("Making Every Number Count"). Saying that *NewViews* lacks traditional accounting controls makes about as much sense as criticizing a car for not leaving manure in the street, and it suggests some lack of understanding of the product. I read the review carefully, and the only lack of control cited by the author is that there is no need to print transaction edit lists before posting.

Moreover, it seems unfair to compare *NewViews* with the more-expensive packages when it is clearly less costly than many of the packages in your "economy-class" analysis and more complete than all of the packages in any class. Perhaps the



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VIEWPOINTS

LETTERS

best thing about the review from this standpoint is that buyers seeking economy-class accounting software will not be discouraged from trying *NewViews*, while those interested in more-elaborate systems will be tempted to try it.

Thomas E. Keiser
Norristown, Pennsylvania

Almost all of the 59 programs we reviewed fell neatly into two categories: low end, the majority costing under \$250; and high end, ranging in price from \$500 to \$2,500. NewViews was one of the very few that fell in the middle. However, based on its features and potential as a serious accounting program, we opted to review it with the big boys.—Bill Howard

IMPROVED COVERAGE

Congratulations on your new cover material—a positive step that continues to demonstrate that your magazine is head and shoulders above the rest.

Robert P. Bryan
Thousand Oaks, California

PC Magazine is the best magazine I have found this side of the ocean, from the Editor's Screen to After Hours. And you have just made it better by stylifying the cover of *PC Magazine*. This dramatically helps in bringing your book to me in one piece, even after the transatlantic trip.

Michael Gallmann
Montrouge, France

A SCANDAL IN INSTANCIA

John C. Dvorak has covered only half of the scandalous truth in his exposé "The BS/2 Operating System—Scandal in Instancia S.S.R.," (*PC Magazine*, Volume 6 Number 15). Big Red also announced that people who buy the Peoples System/2 will be able to upgrade to BS/2 GOS when it is available. However, careful analysis by an analyst here in REDmond indicates that with the exception of the BS/2 Extraordinary Memory Specification, there appears to be little difference between the specifications for BS/2 GOS 1.0 and GOS 3.30 used with *Millisoft Levolors* 1.03. The problem is, not enough of the Peoples are parting with their rubles for the regular, but oh-so-slow in coming, fixes to GOS.

Thus, the real reason behind BS/2 GOS

■ The real reason behind BS/2 GOS is to get the Peoples to part with rubles for an upgrade.

is to get all of the Peoples to part with some rubles for an upgrade. At the same time, *Millisoft* will add handsomely to its royalty portfolio by forcing more software developers into buying licenses for *Levolors*. In turn, Big Red will get a slice of the royalty pie for its part in the scheme. Our analyst tells us that if all goes well with the BS/2 GOS ploy, *Millisoft* and *Instancia Business Machines* plan to do it all again in 1991 to commemorate the tenth anniversary of their relationship.

Craig Dupler
Redmond, Washington

NUMONICS NOT INCLUDED

In the article, "Tablets for Precision Graphics" (*PC Magazine*, Volume 6 Number 14), you neglected to include *Numonics Corp.*, a manufacturer of digitizing tablets and plotters. We do not take offense at the lack of inclusion in this article, but we would like your readers to know that we have been manufacturing high-quality products for 19 years.

Celeste Cygan Hafler
Numonics Corp.
Montgomeryville, Pennsylvania

FIRST THINGS FIRST

Thank RAM for Jim Seymour! His column in the September 15 issue really hit home ("Software Sells Hardware," *PC Magazine*, Volume 6 Number 15).

Sure, the PS/2s are "sexy," and they produce nice graphics. Some of them are even designed to stand on the floor. So what? I have one of Mr. Seymour's referenced \$1,500 clones. It produces nice graphics and it stands on the floor. (Sexy I can get at home, thank you.) However, the software to run this machine—DOS 3.1—doesn't recognize the entire 1-megabyte on the motherboard and can't handle

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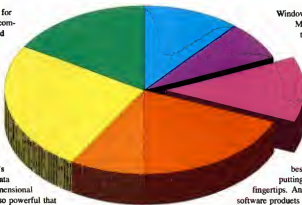
Introducing Windows GRAPH: Now the most powerful business charting program is also the easiest to use.

Choosing a charting package for your business used to be a compromise. Software either required a degree in mathematics or lacked the features to get the job done. But now, with Windows GRAPH, your ideas are no longer pie in the sky.

With Windows GRAPH, you can create charts and graphs with the click of a button. Create area, bar, column, line, pie, exploded pie, scatter, combination, and table graphs. Enter data directly into GRAPH's worksheet or turn spreadsheet data into stunning two- and three-dimensional color graphics. And GRAPH is so powerful that you can create an unlimited variety of charts and an unlimited number of charts per page. Then you can combine and enhance them using GRAPH's free-form drawing and text capabilities. The result: clear, crisp, accurate graphs.

Windows GRAPH is unprecedented in power and ease. Novice users can begin immediately loading data from existing spreadsheets such as 1-2-3, Multiplan, and Visicalc, and selecting default chart types from menus. Experienced users can exercise complete interactive control over customization and layout of charts, drawings, and text.

And with Windows GRAPH, you can create advanced scientific and business graphs such as log-log and semi-log variations, as well as linear, exponential, and logarithmic regressions. Even "hot-link" your graphs to another application for instant access to real-time data.



Windows GRAPH is compatible with Microsoft Windows, so you can take advantage of "state of the art" hardware and other Windows-compatible applications, such as Aldus' PageMaker, Microsoft Windows Write, Micrografx In*ra*Vision, and Windows DRAW.

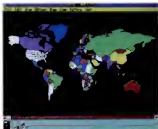
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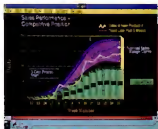
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■ LETTERS

anything larger than a 32-megabyte hard disk. And IBM wants us to buy computers with more RAM and more disk storage?

I say to IBM: Produce the operating system that will utilize what I already have and then we can talk. Until then, the PS/2s will be PC Portables in waiting.

Steven J. Kopischke
Minneapolis, Minnesota

PC PRAISE

You are really impressing me with your recent issues—the Programming/Utilities, Power User, and User-to-User columns have been godsenders. Thank you.

David Shor
Pacific Palisades, California

Your magazine is far and away the best thing going for people who are interested in personal computing. I especially enjoy your *Communiqué* section—it's the first thing I turn to when an issue arrives. Also, the new After Hours column is a real winner. We can't be using 1-2-3 and dBASE III Plus all the time, can we?

Patricia Phelps
Boca Raton, Florida

TIPS FOR KEYING IN BASIC

Although I use a modem and a macro assembler, I find keying in the BASIC listings in your Productivity section a challenge and a rewarding experience. For those readers like me who enjoy the efforts and rewards of keying in BASIC listings, here are two tips:

First, buy a flexible magnifying lamp for ease in reading the listings; second, dictate the data listings only to a cassette recorder, spacing dictation to accommodate your keying-in speed. In effect, copying the long data statements by hearing the listings is a piece of cake compared to reading them. (I assume you will use *PC Magazine's* DATAMAKE.BAS program to merge the foregoing data statements with the nondata portion.) Try it—once you get the hang of it, you'll like it.

Kenneth N. Worden
Sun City, Arizona

THE PS/2 ARRIVES

I don't believe it! *PC Magazine* actually likes the IBM PS/2 line of computers (First Looks, *PC Magazine*, Volume 6 Number

10). Where was John C. Dvorak and his usual IBM cheap shots?

Joe Le
Houston, Texas

We all know that John C. Dvorak hates *Microsoft Windows* (Inside Track, *PC Magazine*, Volume 6 Number 8) and does not look upon mice with as much love as he does the command line (Inside Track, *PC Magazine*, Volume 6 Number 9), but what does he think about *Windows*, graphic interfaces, and those funny dialog boxes now that they will become part of the new DOS? With the introduction of the PS/2 line, even IBM is manufacturing a mouse and joining the *Windows* bandwagon.

Bryan Kinkel
Simsbury, Connecticut

Mr. Dvorak says "funny" is the operative word here.—Ed.

GREAT IDEA

Thank you for the Editorial Product Index, and, in particular, the Productivity listing by department and page number. Give someone a raise for this great idea!

Mike Reinhardt
Farmington Hills, Michigan

CORRECTIONS/AMPLIFICATIONS

The Tandy 1000 EX is the model housed in an all-in-one chassis (First Looks, page 33, *PC Magazine*, Volume 6 Number 15).

The price of Master Control Systems' *LinkMaster* Electronic Service is \$179.95 (First Looks, page 38, *PC Magazine*, Volume 6 Number 15).

HOW TO WRITE TO PC MAGAZINE

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—Steven Rosenthal, *PC Week*
September 11, 1985

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At the heart of the system is the GCI standard Development Toolkit. It has all language interfaces and device drivers for keyboards, mice, joysticks, tablets, printers, plotters, cameras. The drivers completely insulate your application from concern for device idiosyncrasies.

GSS Kernel™ conforms to ANSI's GKS 2b and has all its drivers and language bindings. Macro level tools to draw, color, rotate, transform, area and render, create an object. The Metafile Interpreter reads ANSI GCI files with full GCI capability for recreation on various devices. Any software? IBM thinks so. They sell GSS under their own label. Royalties. Needs 256k.

dBASE AT THE SPEED OF C

dBx Translates dBASE Applications to C

You dBASE™ programmers know what an expressive and readable language dBASE is. It's a very comfortable development environment. But the price is database performance. Even compiled dBASE doesn't offer the speed that some users require in these days. The kind of speed offered by software written in C language. The answer is dBx™. dBx translates dBASE to C. It offers you

a major competitive advantage over the next dBASE programmer. Keep writing in dBASE. Take every application all the way to completion. Then use dBx to translate them top to bottom to C.

Other advantages: C is portable even to other operating systems like UNIX/ VMS/ Nu-11. To the Macintosh or Amiga. dBx gives your applications a passport to places dBASE cannot go.

It has its own file manager for single user, multi-user, file managers—C-tree and dBx—for compatibility with dBASE files or multi-user support. We have everything you'll need, including good advice.

Let	PC Brand
dBx	\$ 350 \$ 290
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With Full Source Code	\$1500 \$1282

DBC Identical dBASE III Plus Files Using C

dBCTM is a series of C libraries from dLance which creates, accesses and updates files identical to those of dBASE. Well, so dBASE can read and update the files too.

What if? It means both C and dBASE applications can operate on the same data bases interchangeably. It means C programmers can interface with the fast market of dBASE users out there, yet achieve the dBASE language. It means dBASE applications can now be linked to the extensive C of libraries and tools to add windows, graphics, statistical analysis, all the things dBASE cannot do. It means the speed and power of C to improve files accustomed to dBASE.

dBx's functions parallel all dBASE's file handling commands, many decomposed to permit direct data manipulation. Our version of dBx maps file formats to dBASE II and III and now dBASE III Plus makes your programs network ready as many stations as a network allows. Supporting all fully ordered networks, dBASE II, III, Let \$250 Curs \$195 dBASE III Plus. Let \$595 Curs \$495. Pay double and you get source too!

PANEL PLUS Screen

Favorite Has Library Source

There are no screen design and data entry tools quite like Panel Plus. With it you create a screen under program control using Panel Plus's menu and data entry by field, then pass it to Panel a code generator which delivers C source code to work with as you please. The code calls Panel Plus's function library, but now the library comes as source, so everything is portable and changeable.

Has every imaginable feature. A screen can have 1000 fields stacked 127 levels deep. Each field can be boxed, colored, multi-row, word-wrapped, scrolled, four ways linked to help messages, and can be a primary or related entry data entry—a real feature.

Operates in graphics mode via interfaces of graphics products it supports. Has a built-in 40-line screen. Accessible to various keyboards, screen operators systems. Moves fast with years of evolution. **Let \$495 Hse \$395**

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PC BRAND ANSWERS THE MOST ASKED QUESTIONS ABOUT CLIPPER™

What Does The Clipper Compiler Do?

Clipper™ compiles dBase III™ and dBase III Plus™ source code programs, procedure and format files into a binary program which can be distributed and executed independent of dBASE.

How Much Faster Is Clipper?

Applications run anywhere from 2 to 20 times faster than the same application in dBase III or dBase III Plus. The average application typically runs 5 or 10 times faster.

How Compatible Is Clipper With

dBase III and dBase III Plus?

Clipper supports the majority of dBase III commands except those that are normally used interactively. There are some minor differences in the implementation of some other commands.

DBF, FRM, MEM and LBL files are the same as interpretive dBase III. Clipper index files have the extension .NTX (corresponding to dBase .NDX) and result in faster indexing and more efficient use of disk space.

NEW VERSION: CLIPPER SUMMER '87

- compatible with Microsoft C
- NDX file compatibility option
- compile-time and run-time speed enhancements
- complete file I/O control
- more open files utilizing DOS 3.3
- error handling
- enhanced debugger
- added commands and functions
- purchasers of Autumn '86 version will receive a FREE diskette upgrade

Does Clipper Support Networking?

Yes. Both versions Autumn '86 and Summer '87 allow you to run compiled applications on most major networks. They feature record and file locking and support Expanded Memory.

A second work station may view and read a locked record or file and produce reports. However, an operator of the second station cannot update or write to a locked record or file.

Do I Need Any Kind of Runtime Module To Run A Clipper Compiled Program?

No. Clipper produces an object code module with the extension .OBJ. When the .OBJ file is linked (using PLINK86 which is included) a relocatable file with the extension .EXE is produced which can be run directly from DOS.

Do I Need Clipper For Every Program I Distribute?

No. You can compile and distribute as many programs as many times as you wish. Nantucket charges no runtime or royalty fees for distribution of your compiled applications.

Are There Royalties For Adding Work Stations?

No. Clipper places no limits on workstations. You may add as many work stations as your networking software will allow with no additional fees.

Does Clipper Handle Memo Fields?

Yes. Memo fields can be stored as string values, allowing them to be searched, concatenated and REPLACED. ASCII text files can be read into memofields and memofields can be read into ASCII text files.

What Size Are Clipper Compiled .EXE Files?

The minimum size Clipper file is about 120K. This overhead is a one time expense and is present in even the smallest program. DOS requires 30-40K of memory. In addition, Clipper requires 64K for its own purposes once loaded, which means that in a 256K machine you could load a program of about 160K into RAM. If you create a program that exceeds your computer's memory, you may create overlays to work around the problem.

What Are Overlays?

Overlays are portions of your application that will NOT reside in your computer's memory until executed. An area of memory is designated for overlays by the linker. You then specify which portions of your program are transferred in and out of that memory area.

In What Language Is Clipper Written?

Clipper is written in the C language with some assembly language routines.



dBase III and dBase III Plus are trademarks of Ashton-Tate. Clipper is a trademark of Nantucket Corporation. PLINK86 is a trademark of Phoenix Software. Microsoft Windows is a trademark of Microsoft.

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REAL PROGRAMMERS DON'T USE dBASE. OR DO THEY?

We're finding that some very swift programmers are using dBASE™ to write some very fast applications, and are completing their projects much more quickly. But they cheat.

They use the Clipper™ compiler to combine dBase with C and assembler.

With dBASE used like pseudo-code, they can then quickly create prototypes that actually run.

Then, with dBASE doing the high-level database functions, they use the Clipper compiler to link in C or assembly language modules from their own bag of tricks.

And they're finding that they're linking in less than they expected because Clipper compiled code runs so fast and because of Clipper's built-in enhancements Clipper includes:

- Easy networking that provides file and record locking the way it should be done.
- Fast screens that can be treated as memory variables and eliminate the need for direct screen writes and all that tortuous heap management code.
- Box commands that made windowing a breeze. And more.

So if you'd like to use your time more productively, check Clipper out.

Does Clipper Allow You To Create Windows?

Yes. With Clipper's new SAVE SCREEN and RESTORE SCREEN commands windows can be created and manipulated.

Will Clipper Interface With Microsoft Windows™?

Clipper will run and compile with Microsoft Windows™ but will not run as a separate task.

Is Clipper Limited To 640K Of RAM?

No. Clipper employs the Lotus/Intel/Microsoft™ expanded memory protocol, allowing use of up to 1 megabyte of RAM.

What Hardware Is Required To Run Clipper?

Clipper runs on any IBM PC, XT, AT, 3270 or 100% compatible machine running DOS 2.0 or greater for single user applications. Networking applications run on most major networks supporting DOS 3.1 or higher.

Is Clipper Copy Protected?

No. Copy protection was removed with the release of the Autumn '86 version.

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ZSoft N.e.w.S

ZSoft Announces New Windows Products

PC Paintbrush® and PC Paintbrush+, ZSoft's best-selling line of graphic paint programs are now also available on sophisticated running under Microsoft's Windows Operating Environment.

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PC Paintbrush for Windows is available immediately from ZSoft. PC Paintbrush+ for Windows is scheduled for release in August.

Both products can be run under and enhanced graphics mode supported by Windows.

For more information on the new Windows products or to obtain a copy of the new software, call or write ZSoft at 430 Franklin Road, Suite 100, Marietta, Georgia 30067.

Publisher's Paintbrush supports the new EISA display adapter for the models 55, 60, and 80 in selected 386 and 486 PCs.

The PC's graphic modes are of special interest to desktop publishers. The EISA mode results produce the same quality as the screen. When the printer is printed on a 300 dpi printer such as a laser printer, What You Get Is What You Expect, instant clarity on the screen are truly visible on the printed page.

PC Paintbrush, PC Paintbrush+, and Publisher's Paintbrush are available in either 1.44 or standard 5.25 diskettes. Give us a call if you need an upgrade your current version or would like more information.

ZSoft Corporation can be reached by phone at (404) 428-0000, or by mail at 430 Franklin Road, Suite 100, Marietta, Georgia 30067.

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IBM PS/2 Fully Supported

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■ MITT JONES

PC ADVISOR

Help in choosing a Turbo Pascal debugger, in finding a RAM-resident cut-and-paste program, and in using color graphics applications on a Hercules monochrome system.



TRANSFERRING TEXT

Do you know of any memory-resident cut-and-paste programs? I have a copy of *Side-Kick*, but what I am really looking for is not an integrated package but a single-function program. Integrated packages gobble up too much RAM.

Jan G. Wilms
University, Mississippi

Turn to *Utilities* in PC Magazine, Volume 6 Number 18, for *SNIPPER*, a RAM-resident cut-and-paste program that should fill your needs.

SNIPPER, also available through the PC Magazine Interactive Reader Service, occupies only a few kilobytes of RAM and lets you cut up to a screenful of text for routing to a printer or a disk file or for pasting into another screen later.

If *SNIPPER* doesn't fill the bill for one reason or another, try *Cut/Paste, Version 3.0*, or *CTRLALT, Version 2.0*, both public-domain/freeware software that occupy little RAM and are meant primarily for cut-and-paste operations. Both programs are available on *CompuServe* (stored as *CP3.ARC* and *CTLALT.ARC*). You should be able to find them on other bulletin boards as well.

TURBO PESTICIDE

I program in Turbo Pascal and am happy with the package on most counts. However, I'd like a way to debug my programs without resorting to DOS's *DEBUG*. Any suggestions?

Donald Cummings
Baton Rouge, Louisiana

Of the field of several third-party Turbo Pascal debuggers, T-DebugPLUS (\$60; TurboPower Software, Scotts Valley, Calif.; (408) 438-8608) rates as the clear winner for all-around power, convenience, and ease of use.

T-DebugPLUS runs as a shell over the Turbo Pascal compiler. When you execute your program, T-DebugPLUS divides the screen into two windows, leaving the top for your source code and taking the bottom for itself. You can then trace your program one step at a time, execute function calls as one step, display the value of any variable in just about any format, and even display the available memory.

Borland International reports that Turbo Pascal will sport its own debugger in the not-too-distant future, so you may want to hold off until you see what Borland has to offer. It's difficult to imagine a much better debugger than T-DebugPLUS, however.

■ When you execute your program, *T-DebugPLUS* divides the screen into two windows, leaving the top for your source code and the bottom for itself.

CHECKERS, ANYONE?

I have been unable to find a checkers game for my Compaq Deskpro. Yes, chess games abound, but the lowly game of checkers is an orphan.

Leonard H. Specht
Rockport, Texas

Cheer up: checkers games aren't easy to find, but they're there, lurking in the public-domain and shareware backwater.

If you've got a modem, dial up *CompuServe*, *The Source*, or your favorite bulletin board. Most large bulletin boards sport a checkers game or two.

Otherwise, try *Checkers (The Genesis Project)*, Bloomington, Minn.; (612) 881-9160. Checkers offers three levels of play and displays a fairly nice semblance of the board on the screen. The game is relatively challenging at the most difficult level, but the scheme for moving pieces could use a little improvement. Checkers is shareware, so you'll be asked to make a small donation.

FULL-COLOR MONOCHROME

Is there any way to run programs written for color monitors on Hercules graphics systems? I have a Leading Edge Model D with Hercules graphics built into the motherboard. Programs expecting a CGA monitor either issue an error message or leave my screen blank.

Donald J. Jackowski
Mine Hill, New Jersey

Several packages, some commercial and others public domain, will enable Hercu-

■ PC ADVISOR

les adapters to emulate color/graphics adapters.

Heracles technical support recommends Athena Video BIOS (\$40; Athena Digital, Athens, Ga.; (404) 354-4522), a combination hardware and software solution that seems to be the most versatile.

Athena Digital reports a success rate of about 95 percent running CGA software, the remaining 5 percent being programs that attempt to write directly to the CGA registers.

The hardware portion of the Athena Video BIOS accounts at least partially for the product's high rate of compatibility. Many CGA programs that don't write extensively to the registers do access the status register. The Athena has terminator, which occupies one slot, supplies the information the software is looking for when it checks that register for the status of the CGA, in effect tricking the software into believing the CGA hardware exists.

■ Athena Digital reports a success rate of about 95 percent running CGA software.

If all your slots are full, there are software packages that may suit your needs, though the net result won't be as attractive as the Athena. Of the software packages, Mode-MGA (\$79.95; T.B.S.P. Inc., Los Angeles, Calif.; (213) 312-0154) rates as the most versatile and best implemented. SIMCGA, found on larger bulletin boards under the name SIMCGA ARC, finishes a close second.

On the downside, with the Athena Video

BIOS or the software products, you will notice "ghosting" of moving objects, especially when you are playing arcade games, and your screen may jump a bit and display snow when you are changing modes. You may also notice a display speed decrease.

Your Leading Edge includes a color graphics adapter on the motherboard, which can cause problems with this type of product. SIMCGA won't work at all on your Leading Edge. Mode-MGA handles the conflict fairly well and will let you display a fairly large selection of CGA software. Athena Digital reports as good a track record with the Leading Edge as with any other PC.

ASK THE ADVISOR

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FIRST LOOKS

Lotus Quickens, Smartens 1-2-3 with Two Free Add-ins



HANDS ON

BY GUS VENDITTO

Action in the spreadsheet wars intensified this week.

Lotus Development Corp. fired several salvos from its East Coast headquarters that destroyed some of the ammunition stockpiled by the gathering field of spreadsheet upstarts. Lotus renounced copy protection for future products and began distributing free copies of two 1-2-3, Release 2, enhancements: Speedup and Learn.

Lotus didn't refer to its opponents by name in this battle for the hearts and minds of reg-

istered 1-2-3 users. But by its actions, Lotus moved into a defensive posture. Microsoft's *Excel* is out (see First Looks, page 33, *PC Magazine*, Volume 6 Number 19), and Borland's *Quattro* is due any day. *Surpass* and *Lucid 3-D* promise to make spreadsheet linking available before the end of the fall.

A Sign of Release 3?

The next major release of 1-2-3 is not expected until 1988; Lotus won't commit to an expected completion date, other than to promise delivery for some time between January 1 and June 30, 1988. If these new add-ins are any indication, Lo-

tus's programmers are capable of satisfying the growing demands of longtime spreadsheet jocks.

The most impressive of the two free add-ins, Speedup, provides faster recalc performance in two ways: A Standard speedup goes into effect when the add-in is loaded, and an Optimal recalc is available for times when only minor changes are made.

Standard can become an invisible shot-in-the-arm, since it goes on when Speedup is invoked and you can have it load automatically when you boot 1-2-3.

The Optimal mode is essen-

tially minimal recalc: it solves only those equations in which the formulas or values changed since the last calculation, giving improved performance on large spreadsheets. If you have a spreadsheet with a wide network of cell dependencies, Optimal could be a time waster, since the program does require a tiny bit of effort to determine which cells changed; for those times, you'll want to stick with Standard recalc.

Learn is a macro recorder, pure and simple. All it asks is that you set aside a range in which the keystrokes can be logged. That done, you press

(continues on page 34)

Quartz DBMS Under Windows Captures Mac's Look and Feel



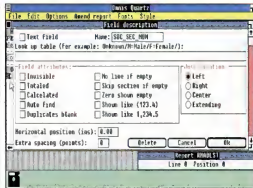
HANDS ON

BY MIKE FALKNER

Following the example of Aldus Corp., Blyth Software has ported its popular Mac database, *Omnis 3*, to the *Microsoft Windows* environment. Its new *Omnis Quartz* succeeds in bringing the look and feel of the Macintosh into the PC environment.

An *Omnis Quartz* database consists of two files, one containing the data and another containing the five formats that make up an application. You define the characteristics of

(continues on page 34)



Omnis Quartz lets you define text fields, data fields, or calculations anywhere.

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Q&A WRITE

Yet another new word processor? 48

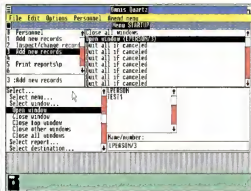
Omnis Quartz

(continued from page 33)

each field in the database using the file format. You create entry and inquiry screens with layout formats, design reports with a report format, and limit the items printed with a search format. You can also create pull-down menus with the menu format and assign powerful commands to them to create a sophisticated database application.

In addition to entry and display fields, *Omnis Quartz* brings many Macintosh features to its entry screens. You can have box fields that display an X, for "true," when selected. You can set up a group of buttons for selecting one of many options, push buttons to execute a sequence of commands, and list fields to display a window of information.

You can use either mouse or



Omnis Quartz's menu-formatting option is a powerful way to add up to 12 custom menus to your application. Quartz displays the menu lines in the upper left, the commands to be executed on the right, and the available commands on the lower left.

keyboard commands to build and use your *Omnis Quartz* application. Up to 60 files can exist for an application, and they can be linked together in any combination. You can also cre-

ate complex reports that span multiple pages and contain custom page headers, detail lines, and breaks for totals.

Omnis Quartz is sometimes complicated, but it has an excellent tutorial and a good reference manual. Some features are a bit cumbersome and take some time to master, if you're experienced with *Microsoft Windows*, however, you'll feel right at home. For example, the Tab key moves you from field to field, not the Return key. However, *Omnis Quartz* does a good job anticipating your next move in all but a few situations.

Since *Omnis Quartz* uses the

PC FACT FILE

Omnis Quartz, Version 1.0

Blyth Software Inc.
1065 E. Hillside Blvd., #300
Foster City, CA 94404
(415) 571-0222

List Price: \$795

Requires: 640K RAM, hard disk drive, mouse, DOS 3.0 or later. *Microsoft Windows* runtime module is included with the package.

In Short: A sophisticated database that brings the ease of the Macintosh to the PC under *Microsoft Windows*. Not copy protected.

CIRCLE 438 ON READER SERVICE CARD

Compaq's MS-DOS 3.31 Shatters 32-Meg Barrier on a Wide Assortment of Disks

Compaq Computer Corp.'s new 20-MHz 386 PCs, the Deskpro 386/20 and the Portable 386, are so impressive that they've partly obscured the new MS-DOS 3.31 that came to market with them (see *First Looks*, page 33, *PC Magazine*, Volume 6 Number 19). Compaq has given us more than the world's fastest PCs—in cooperation with Microsoft, it has finally given us a DOS that recognizes more than 32 megabytes on a disk.

PC Labs tests found that Compaq's new DOS works on many non-Compaq machines, including PC's Limited PCs and IBM PC ATs.

The 32-megabyte barrier in all versions of DOS until 3.31 is a result of the standard PC's ROM BIOS assuming that the sector size on a disk is 512 bytes. Because all of the sectors are numbered with a 16-bit value (the logical sector number), there's an absolute limit of 64K sectors that can be recognized. Multiply 512 bytes by 64K, and you've got a hard disk limit of 32 megabytes.

Compaq and Microsoft have changed the sector access procedure to use either a 16-bit or 32-bit logical sector number. They've added a new disk type (Type 6) that allows a disk partition to use 32-bit values. This change alone means that disks with capacities greater than 32 megabytes can be configured as one logical disk, up to a whopping 512 megabytes. They've retained the existing types, so it's possible to configure another partition with 16-bit values on the same disk.

Of course, some software may have problems with the configuration. Most disk organizer and disk-caching programs do not work because they assume the logical sector number is a 16-bit value. Compaq solves one of these problems by providing a disk-caching program. All of the applications, networks, mice, tape drives, and other peripherals we tested worked without any modification.

—Gus Venditto and William G. Wong

Lotus Add-ins

(continued from page 33)

Alt-F5 and enter the strokes you want to record; press Alt-F5 when you're done. The macros are saved in standard format so you can edit them if you like.

Both need to be installed through Lotus's add-in manager. If you've already installed one or more add-ins, you may need to install an enhanced version of the manager, since both programs run only under Release 1.1 of the add-in manager. Learn can be installed under 1-2-3, Release 2.0 and 2.01, but Speedup works only under 1-2-3, Release 2.01.

Competition is usually good for the consumer. In the spreadsheet wars, that's clearly proving to be true.

PC FACT FILE

Speedup Learn

Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
(800) 872-3387

List Price: Free from authorized dealers or via The World of Lotus forum on CompuServe; \$20 handling charge if ordered directly from Lotus.

Requires: Learn: 1-2-3, Release 2.0 or 2.01; Speedup: 1-2-3, Release 2.01.

In Short: Two 1-2-3 add-ins distributed on one disk. Not copy protected.

CIRCLE 448 ON READER SERVICE CARD

Hot Line Rings Again: Adds Over 8,000 Numbers, Eases Updates

PC HANDS ON

BY DONALD TRIVETTE

Version 2.0 of *Hot Line*, the popular electronic phone book and automatic dialer, is just off the presses. The good news is that it corrects all the blemishes we mentioned in our previous review (First Looks, page 38, *PC Magazine*, Volume 6 Number 5).

The better news is that the new version expands the 2,000-name and number national directory to 10,000 listings. There are more colleges, government agencies (local, state, and federal), airlines, car rental companies, hospitals, law firms, and Fortune 500 companies than you can shake a Trimline at. Many are toll-free numbers, most include mailing addresses, and all are built into the software.

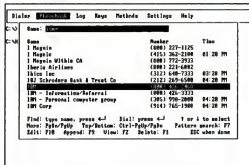
Avoid the Operator

With directory assistance costing 50 cents a shot, it won't take very long for an active caller to recover the cost of the program.

One flaw in the original *Hot Line* was the method of updating the basic listing. Adding a new entry required decompiling the directory, keying in the new data, and then recompiling. With *Hot Line*, Version 2.0, you simply press the F10 key to edit an existing listing, the F9

scores of names and have yet to see a decline in speed.

Re-keying data is unnecessary if you've already got a file of phone numbers. The Import command supports three file types: *Hot Line*, Version 1; ASCII comma-delimited fields; and ASCII fixed-length fields.



Hot Line's national directory, which includes telephone numbers and addresses.

key to add a new entry, or the F1 key to delete an entry. Recompiling is now a housekeeping chore submitted to only occasionally to improve performance, although I've added

Need a hard copy of your directory to take on trips? The Export command creates an ASCII file which can be printed with a word-processing program or text editor.

FACT FILE

Hot Line, Version 2.0

General Information Inc.

401 Park Pl., #305

Kirkland, WA 98033

(800) 722-3244

(206) 828-4777

List Price: \$75; upgrade for registered users of Version 1.0, \$35.

Requires: 256K RAM, one disk drive, DOS 2.0 or later. For direct dialing, a Hayes-compatible modem connected to a telephone line is required.

In Short: An electronic dialer with a comprehensive national directory that's easily updated. Not copy protected.

CIRCLE 433 ON READER SERVICE CARD

Other improvements include the ability to have more than two directories, to dial internal Centrex calls, to accommodate 22-digit phone numbers, and to function on most popular LANs. *Hot Line* works either as a memory resident program or in a standalone mode.

If you're looking for an automatic dialer or an electronic phone directory, you really can't do any better than *Hot Line*, Version 2.0. **DT**



Performance Tests: Lotus 1-2-3, Release 2.01, with and Without Speedup

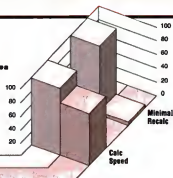
The effect of Speedup on small work is usually too slight to notice, but on large files, the improvement is dramatic. The better than 20-to-1 boost in minimal recalc performance is especially impressive.

Performance Times

(Times given in seconds)

	Calc Speed	Minimal Recalc
1-2-3, Release 2.01	70.1	54.0
1-2-3, Release 2.01, with Speedup	55.0	2.5

Relative Times
(1-2-3, Release 2.01 = 100)



The Calc Speed test spreadsheet contains 2,000 cells between A1 and Z30 with labels and formulas that do four-function math and square roots. The Minimal Recalc test adds an extra column that sums each row; about 5 percent of the formula dependencies change in the recalculation. The tests were performed on an 8-MHz AT with 640K bytes of RAM.

MASM 5 a Must for Assembly Programming



HANDS ON

BY ROBERT L. HUMMEL

It's hard to excite people who voluntarily inflict the rigors of assembly language programming on themselves. But if you want to see some fireworks, slip a copy of Microsoft Macro Assembler, Version 5.0, under an assembly language program-

mer's nose and stand back.

MASM 4.0 was praised for its speed, often cutting assembly times by 75 percent over its predecessor. Microsoft Corp. has continued this tradition by making MASM 5.0 25 percent faster than 4.0. But speed isn't everything. Also included are simplified segment declarations, support for the 80386 and 80387, a version of Codeview that's compatible with four languages, utilities to aid in program development, and completely revised manuals.

As soon as you open the box, you realize that this isn't an ordinary macro assembler. Three reference books and a spiral-bound reference guide provide the most complete and convenient documentation available. Besides the Programmer's Guide you'll find the Codeview/Utilities manual, the Multi-Language programming guide, and a manual that lists the instructions for the 808x and 80x86/7 family of micro-

processors and coprocessors.

This release of MASM also marks the first time that Codeview, Microsoft's phenomenal window-oriented source-level debugger, has been included with the assembler. Codeview allows you to debug your programs at the same level at which you wrote them, including your comments. It also gives you the ability to switch automatically among assembly language, C, FORTRAN, and BASIC.

The real gem of the package, however, is the Mixed-Language Programming Guide. Written in clear language, the guide gives you step-by-step instructions for combining BASIC, C, FORTRAN, Pascal, and MASM routines. Here, gathered in one convenient location, is all the information you would have had to search a dozen reference books for.

If you've never tried assembly code, this is the perfect time to start. Microsoft has set the new standard for macro assem-

blers. MASM 5.0 is a must-buy for high-level and assembly language programmers.



FACT FILE

Microsoft Macro Assembler, Version 5.0
Microsoft Corp.

Box 97017

16011 NE 36th Way
Redmond, WA 98073-9717
(800) 426-9400

List Price: \$150; upgrade from Version 4.0, \$40; upgrade from earlier versions, \$75.

Requires: 256K RAM, two disk drives, DOS 2.0 or later.

In Short: Major revision to the premier assembly language compiler provides a modest speed improvement and a significant enhancement to its documentation. Not copy protected.

CIRCLE 481 ON READER SERVICE CARD

Microsoft Macro Assembler Performance Test

Microsoft Macro Assembler	
2.0	13 seconds
Microsoft Macro Assembler	
4.0	5 seconds
Microsoft Macro Assembler	
5.0	4 seconds

The test file was an 83K-byte ASM file that compiled to a 4.2K-byte .COM file. The test was performed on an IBM PS/2 Model 80

GNU's Cartridges for LaserJet: An Easier Way to Change Fonts



HANDS ON

BY EDWARD MENDELSON

How do you get the flexibility and freedom of downloadable fonts without the headaches of downloading? If you have a LaserJet or compatible, you buy a custom font cartridge from GNU Business Information Systems and never think about downloading again.

The GNU Font Cartridges transform a LaserJet into a customized printer for a corporation or university that needs a special combination of fonts or sizes. An individual user can order fonts that project his preferred typographical image—anything from bold geometrical fonts to flowing scripts. GNU offers more than 200 fonts in

any size and in any standard character set. Custom characters and sets are available on special order.

GNU gets its fonts from Bitstream, which means they are among the best-looking fonts anywhere. The only fonts around that look cleaner are the

most recent ones issued by Hewlett-Packard (mostly under license from Bitstream), in a sharply limited range of styles and sizes. GNU offers everything in the Bitstream catalogue, in cartridges that you plug in and forget.

Each custom cartridge holds up to 128K bytes of fonts in ROM. A 12-point font with the standard keyboard characters occupies about 16K; extended character sets fill about twice that amount. The standard \$199 price per cartridge covers a choice of four fonts; additional fonts cost \$45 each, up to the 128K limit. A series of stock cartridges available off-the-shelf at \$375 provides nine sizes and weights of any one of six popular fonts, including Bitstream's versions of Times Ro-



GNU's cartridge plugs into the socket on a LaserJet Plus or Series II printer.



FACT FILE

GNU Font Cartridges
GNU Business Information Systems

P.O. Box 414

Ramsey, NJ 07446

(201) 825-1222

List Price: \$199, including four fonts; additional fonts, \$45 each. Writers Series cartridges (nine fonts in one of six styles), \$375.

Requires: LaserJet or compatible printer.

In Short: All the variety of soft fonts without the inconvenience.

CIRCLE 425 ON READER SERVICE CARD

man, Galliard, Palatino, Century Schoolbook, Helvetica, and Garamond.

These cartridges are additive. And with a LaserJet II you can even plug in two at once.

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CIRCLE 353 ON READER SERVICE CARD

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Computer Products
A Division of Protege Development

The First Truly Portable Hard Disk Arrives

PC HANDS ON

BY MITT JONES

About a year ago, several manufacturers began promising portable external hard-disk units—a very alluring item for people who need to lock away their data or transfer data easily from one system to another. The Traveldisk earns the distinction of being the first downsized, built-to-travel hard disk to emerge from the vapor.

Ranging in price from \$895 for the 10-megabyte model to \$4,995 for 98 megabytes, the Traveldisk doesn't come cheap. But judging by our tests, these scrappy disks are well worth their cost.

Tradewinds squeezed the controller and 3½-inch platters into a metal case not much larger than the disk itself. The 10-megabyte unit weighs slightly more than 3 pounds and measures 4 inches wide, 6 inches deep, and about 2½ inches high—small enough to fit nicely into a briefcase if you ditch the Traveldisk's padded vinyl carrying case. The 22-megabyte model, slightly larger and heavier, is too big to fit into most briefcases but not too big to tuck into an overnight bag.

But don't expect to hook the Traveldisk up to your laptop unless you've managed to get your hands on a machine with a standard expansion slot. The Traveldisk draws its power (18 watts peak, 12 watts average) through



Three-foot cables connect the Traveldisk to a half-length bus adapter.

a bus extender—a half-length card that installs in your PC, XT, AT, or compatible. A 3-foot-long shielded cable connects to the bus extender on one end and to the Traveldisk on the other.

Installation of the disk is simple, despite documentation that belongs in the Ambiguity Hall of Fame. Once you've installed the bus extender and cable, the Traveldisk checks for the presence of other hard disks.

It will configure itself as the next available drive if it finds no hard disks or only one. If it finds two physical hard disks (not just one with several partitions), it assumes the position of the second hard disk, an annoyance if you're trying to copy files from the temporarily deactivated second drive.

To use the Traveldisk on more than one system, you simply install a bus extender in each system so that you can move the disk as necessary. The Traveldisk automatically reconfigures itself to suit each system.

Tradewinds lists a nonoperating shock rating of 15 and an operating shock rating of 85 for each Traveldisk. To test its real-world ability to survive a beating, I packed the 10-megabyte model along on a 3-day business trip. My hand-me-down steam iron didn't survive the trip, but the Traveldisk did.

Still not satisfied, I slipped each disk into its carrying case and began a battery of punishments you wouldn't want to try at home, climaxing with a 2-foot drop onto the floor of PC Labs. Both disks survived unscathed.

The Traveldisks are also surprisingly fast, considering their shock-resistant nature. Whereas

the JVC disks used in most laptops (including Toshiba's T3100 and Zenith's Z-183) clock in at from 95 to 110 milliseconds seek time, the Traveldisk 22 tested at 64 milliseconds (average random access time). The Traveldisk 10 clocked in at 86 milliseconds.

All in all, the Traveldisk 10 and 22 earn high marks for their durability, ease of installation, and all-around portability. If you've been holding out for a rugged, well-built portable disk, hold out no more.

PC FACT FILE

Traveldisk

Tradewinds Peripherals Inc.
10243 Glenoaks Blvd.
Pacoima, CA 91331
(818) 896-6634

List Price: Traveldisk 10,
\$895; Traveldisk 22, \$1,395;
extra bus extender, \$40.

Requires: DOS 3.0 or later
or AT.

In Short: A durable portable
hard disk that can be moved easily
from machine to machine.

CIRCLE 428 ON READER SERVICE CARD

OfficeWriter Express Has Two for the Road

PC HANDS ON

BY CATHERINE D. MILLER

Earlier this year WordPerfect Corp. introduced *WordPerfect Executive*, the first software targeted toward laptop users. Now Office Solutions is offering *OfficeWriter Express*, the first integrated word processing and communications package for business executives on the go.

While WordPerfect integrated and condensed its product line onto one 3½-inch disk, Office Solutions has opted to make *OfficeWriter Express* a 3½-inch disk six-pack. It adds Hilgraeve's complete *HyperAC-*

CESS communications program (*OfficeExpress*) to a corporate word processor, *OfficeWriter*, Version 5.0.

OfficeWriter, Version 5.0, includes a 40,000-word thesaurus and a spelling checker, as well as the other features you'd expect to find in a powerful word processor.

Office Solutions' decision to use *HyperACCESS* in this package was a wise one. *HyperACCESS* is a time-tested favorite: It's fast and has a powerful script language; at the same time, it's easy to use. And like *OfficeWriter*, it uses function key commands to let you get around in the program.

To integrate the two programs, Office Solutions has added several scripts. The Automatic Document Transfer script is probably the most important. It gives you the ability to send a document automatically once you have created it in *OfficeWriter*. You can also "hot-key" from *OfficeWriter* to *OfficeExpress* by hitting Ctrl-F3 at *OfficeWriter*'s Manage Documents menu.

The idea of integrating a communications program with a word processor for laptop users is one whose time has come. You'll have to judge whether the integration is worth the high price.

PC FACT FILE

OfficeWriter Express

Office Solutions Inc.
2802 Coho St.
Madison, WI 53713
(608) 274-5047
List Price: \$595

Requires: 256K RAM, two
disk drives, modem, DOS 2.0
or later.

In Short: An integrated word
processing and communications
package. Not copy protected.

CIRCLE 429 ON READER SERVICE CARD

Met George. George is a bright guy. He got an IBM PC to help get his work done faster so he could spend more time with the kids. He got word processing software with a spelling checker to help him write better. Then he got mad. Because the computer works but his writing doesn't: word processing makes it easier to write bad. Fast.

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RefSet includes the 300,000 synonym *Reference Thesaurus* that helps you go from achievement, to triumph, to victory in seconds. At 300,000 synonyms, it's probably six times larger (and more helpful) than the one you're using now. You can look up words progressively with the + key and get synonyms of synonyms fast (just like in a paper thesaurus) so you can think your way to the right word. Right away. Synonym listings are categorized by meaning and part of speech and even include antonyms. All of which varies your writing, making it more interesting. And better.

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Black's Law® Dictionary
16,000 terms and phrases of American and English jurisprudence including Latin, Old English and foreign law terms. Legal terms from: constitutional; civil; commercial; criminal; tax; real estate; federal; state; local law and more.

Oil-Spell,™ Oil and Gas Dictionary
7,000 words culled from current oil and gas industry writings, terminology, and jargon.

Reference File
Make virtually any database from any program (like dBASE, 1-2-3, etc.) memory-resident so it pops in and out on demand. That's *Reference File*, our powerful new text oriented database program that lets you create, or import your own references. *Reference File* gives you indexing for lightning-fast searching, sorting, and retrieval by character, or any string of characters.

And, it includes cut-and-paste so you can instantly move information (like names and addresses) into your word processor or other program. Use *Reference File* for an on-line Rolodex®. Build your own phone log or customer tracking system. *Reference File* puts prices, facts, and figures at your fingertips.

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CIRCLE 331 ON READER SERVICE CARD

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PCM1187

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PC WEEK

Dac-Easy Accounting has everything you need to run your business at peak efficiency. Seven accounting modules are perfectly integrated in one system: General Ledger, Accounts Payable, Accounts Receivable, Inventory, Purchase Order, Billing and Forecasting. Data entered once is automatically posted to all modules.

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KEVIN HOWE, PRESIDENT
DAC SOFTWARE

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PC WORLD

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PC MAGAZINE

Our other Version 2.0 products can make the accounting process even easier for your company. Dac-Easy Mate allows you to view accounts, customer, product or vendor files on screen and print to screen; plus it has a fast backup utility that compresses your files without leaving the program. With Dac-Easy Refort you can quickly create custom reports, plus port any file to spreadsheet or database. Accounting Tutor includes a fast primer on accounting for your company, illustrations of the many types of management reports, and step-by-step examples of common business uses.

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PERSONAL COMPUTING

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PC MAGAZINE

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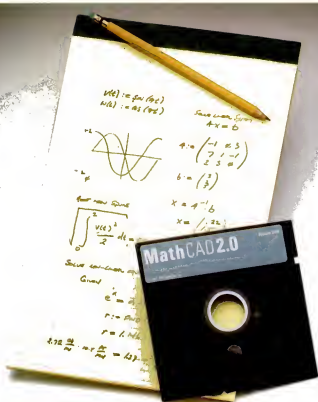
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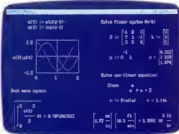
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Faster FoxBASE Allows Custom Functions

PC HANDS ON

BY GLENN A. HART

No language implementation wins every benchmark test, but earlier releases of Fox Software's *FoxBASE Plus* have generally run significantly faster than the major competitors. *FoxBASE Plus*, Version 2.0, and *FoxBASE Plus/386* up the speed ante even further.

The two new *FoxBASE Plus* releases are machine-specific. One is for 8088, 8086, and 80286 computers, while *FoxBASE Plus/386* is for the growing ranks of 80386 PCs.

The primary reason *FoxBASE Plus*, Version 2.0, is so much faster than previous versions is the way it uses memory. The program now runs in less RAM and allocates memory resources far more intelligently. It automatically allocates memory as it runs and can access 64K of expanded memory if you have any. The EMS memory is used as a data buffer and speeds up such functions as indexing and sorting and any operation that uses indexes. The 80386 version utilizes the protected mode available with that processor for even faster execution, but you must have at least 2 megabytes

of memory (the program recognizes as much RAM as you have) and either an 80287 or 80387 math coprocessor for the 80386 version.

A long list of new commands and functions has been added. Perhaps the most significant is user-defined functions (UDFs). As in *Clipper*, you can define new custom functions. The Valid clause that's so useful in user-input validation has been added, and you can even use UDFs in Valid clauses to perform complex validations to ensure input data integrity. *FoxBASE Plus*, Version 2.0, also adds such *Clipper* extensions as light-bar menus, a save-and-restore screen, and a public Fox variable that lets you write code for several language implementations.

Not all the new extensions are inspired by *Clipper*, though. For example, Fox has enhanced its excellent implementation of arrays, which are now allocated separately from normal memory variables. New Scatter and Gather commands transfer data efficiently between database records and arrays.

No matter how you slice it, the program that was generally the fastest has gotten still faster! The list of enhancements is

equally welcome. That these improvements come at no increase in price (for the standard version) is another bonus. I like *FoxBASE Plus* a lot, and if you're a serious user of the *dBASE* language, so will you. ☐



FACT FILE

FoxBASE Plus, Version 2.0

FoxBASE Plus/386

Fox Software Inc.
27493 Holiday Lane
Perrysburg, OH 43551
(419) 874-0162

List Price: Single-user version, \$395; multiuser version, \$595;
FoxBASE Plus/386, \$595.

Requires: 360K free RAM, hard disk, DOS 2.0 or later.
FoxBASE Plus/386: 80386-based PC, 2 Mbytes RAM, math coprocessor, DOS 2.0 or later.

In Short: Superb high-speed *dBASE*-compatible pseudocompiler provides excellent performance and useful language extensions at reasonable cost. The 80386 version is even faster. Not copy protected.

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(Times given in minutes)

	Report 1	Report 2
<i>dBASE III Plus</i>	9.51	62.96
<i>FoxBASE Plus</i> , Version 1.21	3.67	7.51
<i>FoxBASE Plus</i> , Version 2.0	2.75	7.10
<i>FoxBASE Plus/386</i> (based on 2.0)	2.20	4.88

Report 1 consists of 500 records; Report 2 has 5,000. Both were run on an IBM PC AT with an Intel i386 running at 16 MHz with 6.5 megabytes of RAM. While you have to run the 386 version to get truly remarkable speed improvements over the earlier version of *FoxBASE*, note the incredible improvement any of the *FoxBASE* programs provide over *dBASE III Plus*—in one case, less than 5 minutes for a report that took *dBASE* over an hour.

Insider's Guide Gets It Wrong

PC BOOK REVIEW

BY BARRY SIMON

Corey Sandler's *The Insider's Guide to IBM PC Hardware and Software* bills itself as "advanced tips" and claims it will make you a sophisticated PC user. In fact, it deals with pretty basic stuff, such as what to look for at the computer store, and simple facts about hardware and DOS. Power users may eye this kind of book to give to a friend just starting out. Unfortunately, you should give this one only to your enemies.

It doesn't have a bead on its

audience: while it explains what RAM and ROM are, it talks about bits and bytes as if you were already an expert.

It is terribly out of date—the only applications program it mentions is *WordStar*, Version 3.2, and it has chapters on the PCjr and IBM Convertible. It refers to "the new DOS 3.0" (which first appeared in 1984!) and has discussions of DOS 1.1. And I wish I understood why authors of this type of book insist on presenting their trivial BASIC programs rather than telling you about the array of available commercial software, shareware, and free utilities.

But the worst problem is that the book is riddled with errors. For example, it explains that nanoseconds are millionths rather than billionths of a second. Its most egregious error is its debug script to recover an erased file. Such recovery requires you to fix a directory entry and the file allocation table, but this script has only the directory fix. Done alone and followed by CHKDSK /F, which the book recommends elsewhere, this will clobber the information that would let a commercial program recover your file!

If you need this type of book, look elsewhere. ☐



FACT FILE

The Insider's Guide to IBM PC

Hardware and Software

By Corey Sandler
Scott, Foresman and Co.
Professional Publishing Group
1900 East Lake Ave.
Glenview, IL 60025
(312) 729-3000
ISBN: 0673-18720-9

Copyright: 1987

List Price: \$19.95

In Short: The idea of one book that introduces you to hardware, software, and even what to do at a computer store is a good one, but this book is rife with errors.

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\$195 Decision Pad Makes Choosing Easier By Stacking Up Spreadsheet-Like Matrices

PC HANDS ON

BY WILLIAM TAYLOR

Decision Pad, from Apian Software, helps you make decisions using the "decision matrix" strategy. It's one of the easiest decision-support programs to install and use that I've seen in a long while—and I recently tested ten programs in researching the recent *PC Magazine* feature "Searching for Solutions" (Volume 6 Number 15).

Subject to memory limitations, *Decision Pad* can analyze up to 150 alternatives with up to 60 attributes (that is, selection criteria). Adding alternatives and attributes is like adding rows or columns to a spreadsheet. Select the menu entry for adding to the decision, position the cursor where you want the new row or column to go, press Enter, and existing data moves aside to make room. It's as easy as that.

Use Words or Numbers

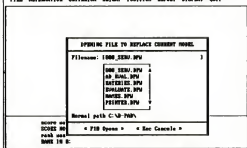
Once your rows and columns are set up, you can edit data as you would change

spreadsheet values, by moving the cursor and then typing in new values. Attributes can be expressed numerically as a rating from 1 to 10 or in words such as *fair*, *good*, and *excellent*. Using familiar words makes it easier to sell a decision.

Decision Pad can make recommendations based on incomplete data. Instead of displaying ERR if you do not fill in a cell, *Decision Pad* calculates the highest and lowest ratings the alternative could have if you were to supply the data. If *Decision Pad* indicates that there is no way for an alternative to win—no matter how you fill in the blanks—you can stop collecting information. This minimizes the cost of the decision because you know when you have enough data.

The user interface is based on the familiar row of choices across the top of the screen. There are four ways to select menu entries—pointing with a mouse, using cursor keys to point to a menu entry, entering Alt-letter combinations (using both a menu name and an entry

FILE ALTERNATIVE CRITERION WEIGHT POSITION REPORT DISPLAY QUIT



Apian Software's *Decision Pad* (\$195) makes use of a Lotus-like structure, including menu bars; in accessing files, you choose through a window menu.

name), or using a slash followed by the first letters of both the menu name and entry name.

The only trouble I had with the user interface was when I tried to read a disk file. *Decision Pad* displays a scrollable list of disk files, but you have to enter Tab to get the cursor into the list to choose a file. I had to appeal to the help screen to learn that Tab was the magic key.

In order to facilitate group decisions, *Decision Pad* features a three-dimensional decision matrix that operates like a stack of spreadsheets with identical rows and columns but with different values. You list the alternatives and attributes, then define a separate matrix for each member of the committee. Each person fills his own matrix, then *Decision Pad* generates the overall scores.

In order to help ensure consistent ratings, *Decision Pad* warns you if one person's score is out of line with the others'. This often reveals information that only one member of the committee knows and helps you keep one member of the group from getting too far off track.

Decision Pad can read and write 1-2-3 files. If you have numbers that affect a decision in a spreadsheet, you can copy them into *Decision Pad*. Once you complete the decision you can transfer the data to 1-2-3 for

printing, plotting, or other manipulations.

Decision Pad rivals the power of *Prism*, reviewed in *PC Magazine*'s recent look at decision support programs ("Searching for Solutions," Volume 6 Number 15). Yet, unlike *Prism*, *Decision Pad* is very easy to use. The overall mix of features is found in no other program I've tested, making it a welcome addition.

Making Your Decisions from a Matrix

Decision matrices are used for choosing from a number of alternatives based on certain attributes. A very simple example is the choice of a car. The alternatives you're considering might be a Hyundai, a Toyota Celica, and a Bentley, and the attributes you want to take into consideration might be price, trade-in value, and prestige.

After you list the attributes, you must decide how important each attribute is relative to the others. You could decide that initial cost is twice as important as trade-in value and that trade-in is twice as important as prestige, for example.

The last step is to score each car on the criteria. A Hyundai is cheap, so it scores high on ini-

tial cost, while the others rate progressively lower based on their higher cost. A Hyundai scores very low on prestige and a Bentley scores high.

Once all the cars are rated for each attribute, the program calculates a score. You pick the car with the highest score.

Of course, the decision that comes out is no better than the data that goes in, and emotional factors can be very hard to quantify. You may not want to admit that the car's appearance is really five times more important than trade-in value, for instance.

When it comes to computer models, an ounce of skepticism is worth a pound of regret.

—William Taylor

PC FACT FILE

Decision Pad

Apian Software
P.O. Box 1224
Menlo Park, CA 94026
(800) 237-4565
List Price: \$195

Requires: 256K RAM (uses up to 640K RAM if available), two disk drives, DOS 2.0 or later. Supports monochrome, CGA, EGA, PS/2, and Hercules displays.

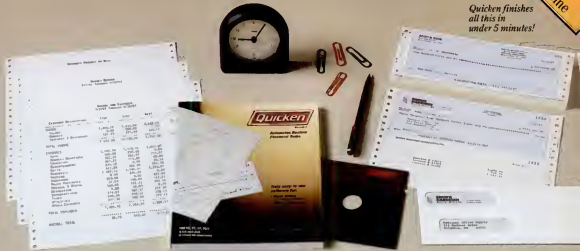
In Short: An excellent decision-support program that combines the best features of its competitors with an ease of use most of them don't have. Available on 3½-inch disks on request. Not copy protected.

CIRCLE 422 ON READER SERVICE CARD

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Here's what the critics say:

"I've never seen such an easy-to-use manual or software that's so simple to use." *Martin Blumenthal, in Cider Magazine*

"Extremely simple and fast."

Esther Dyson, Industry Analyst

"Absolutely the best small accounting program made."

Bob Schwebach, Universal Press Syndicate

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Specifications

Software Compatibility: Exports data and reports in ASCII. Also exports in Lotus® format with optional Transfer Utility. Hardware Compatibility: All IBM® PC, AT, PS/2® and compatibles with 256K RAM and DOS 2.0 or higher. All printers. All monitors. Also available for Apple® IIe, IIc, IIx and GS with most of the same features.

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Number of transactions: unlimited. Maximum amounts:

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Code
PC1187



When you need to move quickly among programs and files, Software Carousel™ carries the load for you.

Why get dragged down by that old PC technology?

Despite the sophistication of today's PCs, there's one thing they still don't do. And that's work the way people work. Jumping from one task to another—from budgets to memos to phone calls and back. Consolidating, cross-referencing, copying and combining.

So every time you need to change programs—or just look at another file—it's the same old, tiresome routine—saving, exiting, loading, retrieving. Not very convenient. Not very human.

But now you have a choice. Either wait for the "next generation" of PC software. Or use Software Carousel, and get the speed and convenience you need today, with the software you already own.

Here's how to make Software Carousel work for you.

Software Carousel is the amazingly easy way to switch almost instantly from WordPerfect to 1-2-3 to dBASE to DOS to whatever else you want. Or go from one file to another in the same program. All without saving or retrieving—or wasting a precious moment of your time. Or your computer's memory.

Software Carousel works by creating a number of independent software slots to load your programs into. You get up to ten of these software slots, so you can load up to ten programs.

Need to crunch numbers? Hit a key and there's your spreadsheet. Need your word processor? Don't bother saving your spreadsheet file. Just whip over to your document and do your work. Swap back to your spreadsheet and it's just like you left it. It's like all your programs are "pop-ups," just a hotkey away.

Or load the same program into three different slots, each with a different file. Now go from one to another in a tenth the time it would take any other way. And with the wonderful feeling that, suddenly, your computer is working right along with you, not against you.

Here's the best part of all.

You may have heard about some other "environment" programs out there that claim to do something similar to Software Carousel. But there are several important differences.

First, they make you split your memory up among the programs you want to use. Software Carousel lets you use all available memory in each and every program, each and every file. It even supports expanded and extended memory.

Other environment programs work with only some software. Software Carousel works with everything. Period. It even resolves conflicts among memory resident programs.

Other software creates a memory intensive working environment that's complex, unfamiliar, with cramped little windows and strange commands. Software Carousel takes minutes to set-up exactly the way you want it. All your software looks and acts exactly as it always did, so you can concentrate on your job, instead of high technology. It's so downright useful, even IBM® recommends it.

Even as you read this page, there are tens of thousands of Software Carousel users out there zipping through their work without laborious and repetitive commands. And without the usual 640K limit imposed by DOS. In fact, even IBM recommends Software Carousel for use with their most popular mainframe-to-PC communications package.

We think you'll agree, that with this kind of speed, convenience, and next-generation performance, \$59.95 is a small price to pay.

Look for Software Carousel at software dealers everywhere. Or order direct from SoftLogic Solutions by calling us toll-free. If, after thirty days, you're not satisfied that Software Carousel is the right way to get old PC technology off your back, we'll gladly arrange for a refund of your purchase price.

Here's what people are saying about Software Carousel:

"Can't believe how well it works. Who needs an 80386?"
—Ralph Evans, Attorney, Fullerton, CA

"Unlike other attempts (e.g. MS Windows, DesqView) your's works, is not fragile and does not intrude its "personality" on everything that we do."
—Colon Ralph, Ralph & Finzer, Inc., Seattle, WA

"Fantastic program. Great book. Saves me an hour a day! Thanks."
—Larry Pearsal, Rolling Hills Covenant Church, Rolling Hills Estates, CA

"Solved all my problems with resident software."
—Walter Aguirre, West Islip, NY

 **Software Carousel** \$59⁹⁵

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CIRCLE 161 ON READER SERVICE CARD

UNLEASH YOUR 80386!

Your 80386-based PC runs at least twice as fast as your old AT. This is good, but not great. The products described below will unleash the true potential of your 80386, giving you 4 to 16 times the power of your old AT. These new MicroWay products include a family of 80386 native code compilers and the mW1167 numeric coprocessor.

Examples of the increases in capacity and performance include:

- Programs compiled with MicroWay

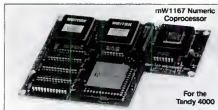
NDP Fortran-386 execute 2 to 8 times faster than those compiled with existing 16-bit Fortrans. NDP Fortran-386 can also address up to 4 gigabytes of memory instead of the standard 640 kbytes. MicroWay's NDP compilers and the programs they generate run on MS-DOS or Unix V.

- NDP Fortran-386 generates code for the 80287, 80387 or MicroWay's mW1167. The mW1167 has a floating point throughput exceeding 2.5 mega-

flops, which is 4 to 5 times the throughput of an 80387 and is comparable to the speed achieved by the VAX 8600.

Equally important, whichever MicroWay product you choose, you can be assured of the same excellent pre- and post-sales support that has made MicroWay the world leader in PC numerics and high performance PC upgrades. For more information, please call the Technical Support Department at

617-746-7341



MicroWay® 80386 Support

MicroWay 80386 Compilers

NDP Fortran-386 and NDP C-386 are globally optimizing 80386 native code compilers that support a number of Numeric Data Processors, including the 80287, 80387 and mW1167. They generate mainframe quality optimized code and are syntactically and operationally compatible to the Berkeley 4.2 Unix 177 and PCC compilers. MS-DOS specific extensions have been added where necessary to make it easy to port programs written with Microsoft C or Fortran and R/M Fortran.

The compilers are presently available in two formats: MicroPort Unix 5.3 or MS-DOS as extended by the Phar Lap Tools. MicroWay will port them to other 80386 operating systems such as OS/2 as the need arises and as 80386 versions become available.

The key to addressing more than 640 kbytes is the use of 32-bit integers to address arrays. NDP Fortran-386 generates 32-bit code which executes 3 to 8 times faster than the current generation of 16-bit compilers. There are three elements each of which contributes a factor of 2 to this speed increase: very efficient use of 80386 registers to store 32-bit entities, the use of inline 32-bit arithmetic instead of library calls, and a doubling in the effective utilization of the system data bus.

An example of the benefit of excellent code is a 32-bit matrix multiply. In this benchmark an NDP Fortran-386 program is run against the same program compiled with a 16-bit Fortran. Both programs were run on the same 80386 system. However, the 32-bit code ran 7.5 times faster than the 16-bit code, and 58.5 times faster than the 16-bit code executing on an IBM PC.

NDP Fortran-386™\$595
NDP C-386™\$595

MicroWay Numerics

The mW1167™ is a MicroWay designed high speed numeric coprocessor that works with the 80386. It plugs into a 121 pin "Weitek" socket that is actually a super set of the 80387. This socket is available on a number of motherboards and accelerators including the AT&T 6386, Tandy 4000 and MicroWay Number Smasher 386 (Jan. '88). It combines the 64-bit Weitek 1163/64 floating point multiplier/adder with a Weitek/Intel designed "glue chip". The mW1167™ runs at 3.6 MegaWhetstones (compiled with NDP Fortran-386) which is a factor of 16 faster than an AT and 3 to 5 times faster than an 80387\$1495

Monoputer™ - The INMOS T800-20 Transputer is a 32-bit computer on a chip that features a built-in floating point coprocessor. The T800 can be used to build arbitrarily large parallel processing machines. The Monoputer comes with either the 20 MHz T800 or the T414 (a T800 without the NDP) and includes 2 megabytes of processor memory. Four or more Transputers can be easily linked together to form a Quadputer. A single T800 is comparable in speed with an mW1167-equipped 80386. The compilers to drive one or more Monoputers include Occam, C, Fortran, Pascal and Prolog.

Monoputer T414-20¹\$1495
Monoputer T800-20¹\$1995
Biputer™ T800/T414²\$495
Quadputer™ T414-20²\$695

¹Includes Occam ²Includes TDS

80287 ACCELERATORS

287Turbo-10\$450
287Turbo-12\$550
287TurboPlus-12\$629

80386 Multi-User Solutions

ATM™ - This intelligent serial controller is designed to handle 8 users (16 with two boards) in a Xenix or Unix environment with as little as 3% degradation in speed. It has been tested and approved by Compaq, Intel, NCR, Zenith, and the Department of Defense for use in high performance 80286 and 80386 Xenix or Unix based multi-user systems\$1299

MicroPort Unix 5.3 is a port of the new Unix 5.3 to the 80386. MicroWay NDP-386 compilers currently run on this version of UNIX.
MicroPort Unix 5.3from \$399

PC-MOS-386™ is an 80386 operating environment that turns an AT with an ATB into an MS-DOS multi-user system. The system makes it possible to run applications such as Lotus 1-2-3 on terminals. The operating system also has a Phar Lap compatibility mode that runs programs developed with the Phar Lap versions of MicroWay's compilersfrom \$199

Phar Lap™ created the first tools that make it possible to develop 80386 applications which run under MS-DOS yet take advantage of the full power of the 80386. These include an 80386 monitor/loader that runs the 80386 in protected linear address mode, an assembler, linker and debugger. These tools are required for the MS-DOS version of the MicroWay NDP Compilers. Phar Lap Tools\$399

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80287-8 8 Mhz\$259
80267-6 6 Mhz\$179
8087-2 8 Mhz\$154
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NEW ON THE MARKET

Microsoft's Windows/386 Taps Memory, Multitasking Power of 80386 Processor

Amid all the speculation about what OS/2 will do and when it will do it, Microsoft Corp. has released *Microsoft Windows/386*. The \$195 operating environment is designed specifically for 80386 PCs.

It provides 80386 machines with multitasking capability, expanded memory support, and 640K bytes of virtual CPU support for existing MS-DOS applications. The operating environment also offers memory management for *Windows* applications and visual compatibility with the Microsoft OS/2 Presentation Manager.

Windows/386 uses the 80386's memory management abilities to provide true multitasking, Microsoft says, allowing you to run several MS-DOS applications simultaneously. MS-DOS applications can be run either in multiple windows or with a single application in control of the full screen. And you will be able to run existing MS-DOS applications in a window alongside *Windows* applications. Existing *Windows* applications will run under *Win-*

dows/386 without modification, Microsoft says.

Windows/386 uses extended memory, in conjunction with the memory-mapping capabilities of the 80386 microprocessor, to emulate the LIM 4.0 specification. Consequently, *Windows/386* supports expanded memory without the need for additional expanded memory hardware.

List Price: *Microsoft Windows/386*, \$195. **Requires:** 80386-based PC; Compaq Deskpro 386 or compatible or IBM PS/2 Model 80; hard disk drive; EGA, VGA, or equivalent video adapter; DOS 3.1 or later. 2 megabytes of physical memory recommended. Not copy protected. Microsoft Corp., 16011 NE 36th Way, Box 97017, Redmond, WA 98073-9717; (206) 882-8080, (800) 426-9400.

CIRCLE 437 ON READER SERVICE CARD



Designed for 80386-based PCs, the \$195 *Microsoft Windows/386* operating environment offers true multitasking of your existing DOS applications.

Modem Routes 19,200 bps Throughput Over a Dial-up or Leased Line

If you feel the need for some high speed, hitch your PC to the Ven-Tel EC18K-34 modem and stand back. Ven-Tel says that the \$1,399 modem operates at up to 18,000 bits per second with integral data compression that yields throughput of up to 19,200 bps. The modem is designed to be used on dial-up lines of any quality, and it may be used on leased lines as well.

Ven-Tel claims that sending 20 pages of text at a rate of 2,400 bps takes about 5 minutes, while the same data whizzes through telephone lines in

only 42 seconds at 18,000 bps.

At lower speeds, the EC18K-34 modem is fully compatible with standard modems and automatically adjusts its transmission speed to the highest rate accepted by the responding modem. The EC18K-34 modem uses the standard AT command set.

Telephone numbers and configuration options can be stored in the modem's internal nonvolatile memory. It can be configured via a telephone from a remote location.

List Price: EC18K-34, \$1,399.

Ven-Tel Inc., 2121 Zanker Rd., San Jose, CA 95131-2177; (408) 436-2177.

CIRCLE 442 ON READER SERVICE CARD

Everex's Evercom II 24 Is First Internal Modem For Micro Channel Bus

The Micro Channel bus is starting to generate an aftermarket of add-in cards. Everex Systems has the first internal modem—the \$399 Evercom II 24, a 2,400-bit-per-second device.

The modem has auto-dial, auto-answer, automatic bps-rate-matching to the calling modem, and automatic sensing of dialing. You can switch between voice and data.

The Evercom II 24 supports the Hayes, Bell 212A/103, CCITT V.22, and V.22 bis protocol standards.

List Price: Evercom II 24, \$399.

Requires: PS/2 Model 50, 60, or 80. Everex Systems Inc., 48431 Milmoet Dr., Fremont, CA 94538; (415) 498-1111.

CIRCLE 438 ON READER SERVICE CARD

Memory Adapter Packs As Much as 14.5 Megs Into PC Expansion Slot

Regardless of which operating system ends up dominating the future PC realm, one thing is clear: you are going to need lots of memory. Quadram Corp.'s

Ad Lib Music-Composing Package Turns Your Computer into an 11-Voice Orchestra

You can generate a whole assortment of realistic instrument sounds on your PC with the Ad Lib Personal Computer Music System, a \$245 combination hardware/software package from Ad Lib. The hardware is an FM synthesis musical synthesizer on a half-size PC expansion board. The accompanying software lets you compose, record, and play back music in up to 11 simultaneous voices.

The synthesizer has a headphone jack, an amplifier that will drive a small speaker, and a volume control.



The \$245 Ad Lib Personal Computer Music System is built around a half-card FM synthesis musical synthesizer.

by Jonathan Matzkin



The Mighty Meg board, from Quadram (\$545 with 512K bytes of RAM), provides the massive memory that future PC operating systems will require.

Mighty Meg holds enough memory for any of the new operating systems, and then some.

The card holds from 512K bytes (\$545) to a whopping 14.5 megabytes (\$4,995) of RAM, and it is compatible with the IBM PC-XT Model 286, AT, and 386 machines.

The board can be expanded to 4 megabytes using nine 256K SIMM (single in-line memory module) devices or to 14.5 megabytes using nine 1-megabyte SIMM devices.

List Price: Mighty Meg, with 512K RAM, \$545; with 14.5 Mbytes RAM, \$4,995. Requires: IBM PC-XT Model 286, AT, or 386 machine; one expansion slot. Quadram Corp., One Quad Way, Norcross, GA 30093-2919; (404) 923-6666.

CIRCLE 441 ON READER SERVICE CARD

The *Visual Composer* software allows you to produce your own musical compositions, even if you should have no formal knowledge of composing.

Visual Composer comes with a variety of preprogrammed sounds, all of which can be layered one at a time to create a finished composition. The program accepts monophonic MIDI (musical input digital interface) input for voice-by-voice editing.

A "jukebox" program allows you to play back preprogrammed selections or music that is generated with *Visual Composer*.

LAN Calendar Program Facilitates Department Scheduling on Network

Lots of applications are available in "network versions," but few programs are designed to exploit the inherent advantages of linked PCs. *EasyCalendar*, from Server Technology (6-user package, \$199.95; 25-user package, \$349.95), takes advantage of PCs that talk to each other.

It allows work-group users to enter, check, or print appointment information. Users can also access appointment information for others on the network.

EasyCalendar runs on any NETBIOS-compatible network, including those sold by IBM, 3Com, and Novell. The program's central database is maintained on one of the networked PCs. The database contains all appointment and task management information and allows any network user to schedule meetings for himself or any other network user.

The Ad Lib Personal Computer Music System comes with a basic guide to music composition. *Instrument Maker*, an additional \$49.95 software package, allows you to create sounds beyond the preprogrammed timbres supplied in *Visual Composer*.

List Price: Ad Lib Personal Computer Music System, \$245. Requires: 256K RAM, two disk drives, half-length expansion slot, headphones or loudspeaker, DOS 2.0 or later. Ad Lib Inc., 220 Grande Allee East, #960, Quebec, Canada G1R 2J1; (418) 529-9676, (800) 463-2686.

CIRCLE 438 ON READER SERVICE CARD

List Price: *EasyCalendar*, for 6 users, \$199.95; for 25 users, \$349.95. Requires: NETBIOS-compatible network. Server

Technology Inc., 140 Kifer Ct., Sunnyvale, CA 94086; (800) 835-1515.

CIRCLE 440 ON READER SERVICE CARD

HOT PROSPECT

Borland's Spreadsheet Arrives with Power, Flexibility, and a Low Price

Lotus is the acknowledged spreadsheet leader, but powerful products from Microsoft and Borland International will soon compete for a piece of the 1-2-3 pie. Microsoft's *Excel* recently debuted, and now Borland's *Quattro* has arrived with a list price (\$195) that's about half of 1-2-3's cost.

Quattro features "intelligent recall," which, Borland says, allows faster spreadsheet operation on frequently used models. The package also has a built-in macro development and debugging environment, and it maintains file and macro-level compatibility with 1-2-3, Release 2.01.

Custom applications can be developed within *Quattro* by using a programmable applications development environment. The package generates presentation-quality graphics and supports the PostScript page description language.

Quattro's transcript facility provides incremental saving

and automatically rebuilds worksheets in the event of a power failure or an unplanned exit from a worksheet.

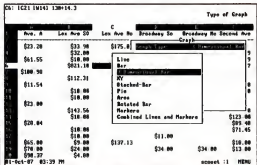
While Version 1.0 does not allow linked spreadsheets, later versions of the program will have that feature, according to Borland. The company will also support the development of *Quattro* add-in products.

The package exploits both Versions 3.2 and 4.0 of the LIM expanded memory specification. The spreadsheet supports the 8087 and 80287 math coprocessors.

Borland will sell versions of *Quattro* for DOS, OS/2 (both character-based and for the Presentation Manager), and OS/2 extended edition.

List Price: *Quattro*, \$195. Requires: 384K RAM, one disk drive, DOS 2.0 or later. Not copy protected. Borland International Inc., 4585 Scotts Valley Dr., Scotts Valley, CA 95066; (408) 438-8400.

CIRCLE 436 ON READER SERVICE CARD



Quattro is Borland's entry in the spreadsheet sweepstakes. The \$195 package is file and macro compatible with 1-2-3, and offers presentation-quality graphics.

PC UPDATE

edited by Peggy Gavan

**Tornado
Library
Version**

Micro Logic Corp. has added a library option to its *Tornado* random note processor. The new version has several enhancements, including a 365-day calendar with unlimited space for notes, a template for project planning, and



The *Tornado* note-processor program has a new library option that adds a template for project planning.

cross-referencing for cities, states, area codes, and time zones. The *Tornado* library version is priced at \$79.95, and upgrades are \$30 for registered users. Micro Logic Corp., Hackensack, N.J.; (201) 342-5930.

**VP-Planner,
VP-Planner
Plus, 1-2-3**

VP-Planner now emulates 1-2-3. Release 2.0, with the introduction of *VP-Planner Plus*. The new version adds 64 functions, support for larger spreadsheets, and a new pull-down-menu user interface. *VP-Planner Plus* is priced at \$179.95, and upgrades are available to registered users for \$50. In addition, Paperback Software International has removed copy protection from its line of software and raised prices on *VP-Info*, *VP-Expert*, and *VP-Graphics* by \$25, to \$124.95. Paperback Software International, Berkeley, Calif.; (415) 644-2116.

**AutoCAD,
Release 9**

AutoCAD, Release 9, is the second release of the design program this year and is an upgrade from Version 2.6 (Autodesk said it is changing its numbering system to signal the extensiveness of the change). Release 9 has a new user interface with pull-down menus, icon menus, and dialog boxes. The new version also has file portability, enabling transfer of *AutoCAD* files across DOS, Sun, and UNIX operating systems. *AutoCAD* remains priced at \$2,850, and upgrades are \$150 for registered users. Autodesk Inc., Sausalito, Calif.; (415) 331-0356.

**Inboard
386/AT**

Intel Corp. has reduced prices on its *Inboard 386/AT* add-in accelerator boards. The *Inboard 386/AT* without RAM is priced at \$1,599, down from \$1,995; the version with 1 megabyte of RAM is now \$1,895, a cut of \$600. Intel Corp., Hillsboro, Ore.; (503) 629-7354.

**Peachtree
Complete II**

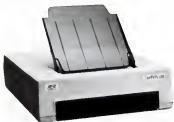
Peachtree Complete II offers several new features, including service invoicing, automatic receivables transactions, and a 160-character invoice-description field. Registered users can upgrade to *Peachtree Complete II*, priced at \$199, for \$99 until December 31. Peachtree, Norcross, Ga.; (404) 564-5700.

**Cubit,
Version 2.0**

Cubit, Version 2.0, reduces 1-2-3 worksheet files by an average of 70 percent and word processing files by 55 percent. In addition, Version 2.0 includes *Uncubit*, a program that allows all users to decompress files that they have received from *Cubit* users via modem. *Cubit*, Version 2.0, is priced at \$49.95; upgrades are \$17.50 for registered users. Soft-Logic Solutions Inc., Manchester, N.H.; (603) 627-9900, (800) 272-9900.

**AST
TurboScan,
EyeStar Plus**

AST Research's *TurboScan* optical page scanner has several enhanced features in addition to a lower price tag. The new version adds easier setting adjustments and includes *EyeStar Plus*, an upgraded release of the original *EyeStar* image-scanning software. *EyeStar Plus*



AST is shipping its *TurboScan* optical page scanner with an upgraded version of the *EyeStar* image scanning software.

features added paint and image manipulation capabilities and a run-time version of *Microsoft Windows*. The *TurboScan* is priced at \$1,795, a reduction of \$600. Current owners can upgrade to *EyeStar Plus* for \$99. AST Research Inc., Irvine, Calif.; (714) 756-4942.

IN BRIEF

Graphwriter II adds new chart types and an automatic batch mode that allows users to output up to 100 charts with one DOS command. Registered users can upgrade to *Graphwriter II*, priced at \$495, for \$75. Lotus Development Corp., Cambridge, Mass.; (617) 577-8500. *4Word*, Version 2.0, supports all .PIC files from 1-2-3 and 1-2-3 add-in packages. *4Word* is priced at \$99.95; upgrades are \$25 for registered users. Turner Hall Publishing, Cupertino, Calif.; (408) 253-9607.

Program in the fast lane with Borland's new Turbo Pascal 4.0!

Our new Turbo Pascal 4.0 is so fast, it's almost reckless. How fast? Better than 27,000 lines of code per minute.* That's more than twice as fast as Turbo Pascal 3.0.

4.0 Technical Highlights:

- Compiles 27,000 lines per minute
- Includes automatic project Make
- Supports > 64K programs
- Uses units for separate compilation
- Integrated development environment
- Interactive error detection/location
- Includes a command line version of the compiler
- Highly compatible with 3.0



4.0 breaks the code barrier

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Sieve (25 iterations)

	Turbo Pascal 4.0	Turbo Pascal 3.0
Size of Executable File	2224 bytes	11682 bytes
Execution speed	9.3 seconds	9.7 seconds

Sieve at C:\Sieve\run, run on an IBM® IBM AT

Since the source file above is the same to indicate a difference in compilation speed we compiled our CHES5 program on Turbo Pascal 4.0 to give you this sense of how much faster 4.0 really is.

Compilation of CHES5.PAS (5469 lines)

	Turbo Pascal 4.0	Turbo Pascal 3.0
Compilation speed	12.1 seconds	35.5 seconds
Lines per minute	27,119	9,243

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Portfolio Makes Clip Art Affordable



HANDS ON

BY GUS VENDITTO

Stop the presses. *PageMaker* publishers. Don't let your newsletters get weighed down by amateurish, home-drawn *Paintbrush* images or stunted by limited access to a scanner. Primp your pages with *Windows Portfolio* clip art.

Portfolio provides you with low-cost access to a series of libraries from Micrografix, which sells most of these pictures as part of *Windows Draw*, a \$495 paint program. *Portfolio* is really little more than a viewer for these libraries, but once you have got the images on the screen, it's quite simple to

point-and-click them into the *Windows* clipboard, then quit *Portfolio* and call them up in

PageMaker or any other *Windows* application that can utilize bit-mapped or object-based pic-



Micrografix's Furniture Clip Art file enhances a *PageMaker* document.

ture files. The *Portfolio* clipboard will select the best format based on the target program automatically.

The \$99.95 package includes the viewer, clipboard, and a general library of over a hundred symbols—some ordinary, some offbeat, clocks, geometric shapes, a weather vane, clouds. You also get a coupon for another of the ten libraries in the series, which include mechanical, architectural, chemical, and military symbols.

List Price: *Windows Portfolio*, \$99.95, additional libraries, \$49.95. **Requires:** *Microsoft Windows*. Not copy protected. Micrografix Inc., 1820 N. Greenville Ave., Richardson, TX 75081; (800) 272-3729.

CIRCLE 429 ON READER SERVICE CARD

The 3-D FastTRAP Points with Precision



HANDS ON

BY GERARD KUNKEL

The FastTRAP, from MicroSpeed, is the latest in pointing devices. Essentially a trackball with three programmable function buttons, the FastTRAP can send x, y, and z coordinates to applications—one plane more than a mouse or digitizing tab-

let. Three-dimensional CAD users should welcome the addition. Immediate response for x, y, and z can cut the time necessary to view an object at various rotations.

Installation of the FastTRAP is quite simple if you've installed a *Microsoft Mouse*. Simply plug in the device to the serial port and use the *Microsoft* driver. If the third dimension is

needed, complete the installation of the FastTRAP and load its KeyMAP software, a memory-resident program/driver. Since the function keys, trackball, and trackwheel can be programmed with KeyMAP, any application that accepts DOS commands can be customized.

Drivers for *AutoCAD* let you call modifiers with the middle button and select menu options



with the trackwheel. The left button is Pick, the right is Enter, and the trackball controls the pointer position.

The FastTRAP works best in a 3-D CAD application. Another benefit is clear, though. Since the trackball device is stationary, precision placement of the cursor in graphics mode is easier than putting a mouse into position, only to have it move when the button is pressed.

List Price: FastTRAP, \$149. **Requires:** Serial port. MicroSpeed, Inc., 5307 Randall Pl., Fremont, CA 94538; (415) 490-1403.

CIRCLE 431 ON READER SERVICE CARD

CIRCLE 430 ON READER SERVICE CARD

Boston Doc: An Additional Level of Help



HANDS ON

BY PEGGY GAVAN

You're about to finish a spreadsheet, with one last @INDEX function, when suddenly your mind goes blank. What are the parameters? You're stumped, but the thought of pulling the dusty 1-2-3 manual off the shelf and searching for the solution makes you cringe. There's got to be a better way.

Boston Doc, a complete online reference guide to 1-2-3,

offers an excellent substitute for Lotus's bulky documentation and shallow help files. With *Boston Doc*, comprehensive and neat help is only one keystroke away.

Boston Doc has "chapters" identical to those found in the manual, plus a 1-2-3 tutorial, a section on creating databases, and an optional index. Unlike 1-2-3's help screens, *Boston Doc* offers complete instructions, suggestions, and examples of every command, function, and macro.

The drawback is that you lose 98K bytes to have all this information at your fingertips. If you're a 1-2-3 master, that's a lot of RAM to lose. But if you're training someone, Christmas is coming soon.

List Price: *Boston Doc*, \$34.95. **Requires:** 256K RAM, two disk drives or hard disk, DOS 2.0 or later. Not copy protected. Boston Documentation Design, 125 Adams St., #301, Newton, MA 02158; (617) 965-5300.

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Programmer's Journal* ”

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Technical Specifications

- ✓ **Compiler:** One-pass optimizing compiler generating linkable object modules. Included is Borland's high-performance Turbo Linker™. The object module is compatible with the PC-DOS linker. Supports tiny, small, compact, medium, large, and huge memory model libraries. Can mix models with near and far pointers. Includes floating point emulator (utilizes 8087/80287 if installed).
- ✓ **Interactive Editor:** The system includes a powerful, interactive full-screen text editor. If the compiler detects an error, the editor automatically positions the cursor appropriately in the source code.
- ✓ **Development Environment:** A powerful "Make" is included so that managing Turbo C program development is highly efficient. Also includes pull-down menus and windows.
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- ✓ **License to the source code for Runtime Library available.**

Sieve benchmark

	Turbo C	Microsoft[®] C
Compile time	2.4	13.51
Compile and link time	4.1	18.13
Execution time	3.95	5.93
Object code size	239	249
Execution size	5748	7136
Price	\$99.95	\$450.00

*Benchmark run on an IBM PS/2 Model 60 using Turbo C version 1.0 and the Turbo Linker version 1.0; Microsoft C version 4.0 and the MS overlay linker version 3.51.

Minimum system requirements: IBM PC, XT, AT, PS/2 and the compatibles. PC DOS 3.01-5.00; 286 or later. 384K.

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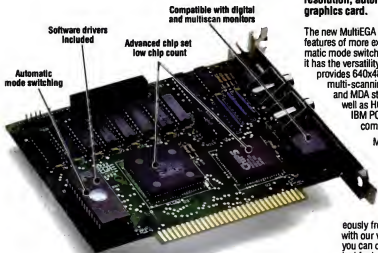
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Paradise Systems AutoSwitch EGA Card Model 480	\$349	Y	N	YES	Y	27	1yr

All information accurate as of 9/15/87

VEGA Deluxe is a trademark of Video Seven Inc.; SuperEGA HiRes. - Genoa Systems; Paradise, AutoSwitch EGA Card - Paradise Systems.

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COMMUNIQUE

edited by Bill Howard

Mea Culpa

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"The VAXmate system unit on the left uses convection cooling, so it is totally silent except for the fan."

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—Dayton-Springfield (Ohio) Business Life, September 1987

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—Federal Computer Week, September 7, 1987

... Geography

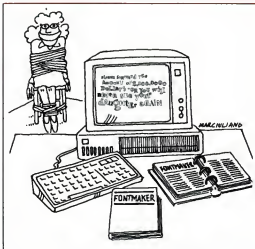
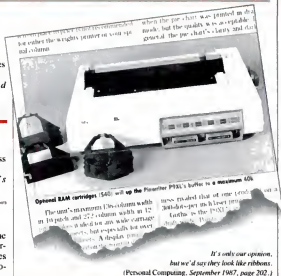
"NEW YORK (AP)—William Gates, the founder of Silicon Valley's Microsoft computer software company, is the world's youngest billionaire, according to a list published by Fortune magazine."

—AP story printed in the San Jose Mercury News, September 20, 1987

... Computer Facts

"Since the AT uses a 80386 processor, Mr. Lallis said he comes out ahead by staying behind . . . The other two [PS/2] models, the 25 and 30, use the 80286 microprocessor."

—PC Week, September 8, 1987, page 59



Heard or seen anything offbeat, unusual, or just plain dumb about the computer industry? Send your offerings to *Communique's*, PC Magazine, One Park Avenue, New York, NY 10016, or MC1 Mail 157-9101. Please print your name legibly and include your T-shirt size. Contributors receive \$50 and a PC Magazine T-shirt. In case of duplicate entries, the earliest postmark prevails. Sorry, but entries can't be acknowledged.

Winners this issue: Thomas K. Woot (NEC cartridge), Robert Paves (Fawn Hall), Bill Steele (VAXmate), Mark Ryland (overwhelmed XT), Phillip G. Pflieger (20-MHz hearing), Jim Warden (near better-quality), Roger Kargus (COBOL), Bruce G. Graham (analogized monologues), Roger Moore (mouses), Glenn Miyashiro (child billionaire), Todd Schrimmon (80386 AT), Darwood Edwards (never used), Garrett Koozer (pagemaker).

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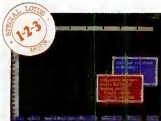
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■ FROM THE EDITOR'S SCREEN ■ BILL MACHRONE

SPEAKING YOUR LANGUAGE



In the face of the best applications programs in the history of computing, some of the oldest products—languages—are doing their best business ever. What's the reason?

Quick—what's one of the hottest product categories for 1987? Would you have ever guessed compilers?

Don't feel bad if you missed this one. You won't be missing it for long. Five years ago the pundits were predicting that high-level languages—and programming—were dead. Applications generators would take care of everything. The idea behind applications generators is seductive. You show the program what job you need to do, and it goes out and builds the files, input screens, and reports.

As you might expect, applications generators make the most sense for problems that databases can solve. That's why products such as Fox and Geller's *Quickcode* have always been successful. Database manufacturers include applications development tools, such as Microrim's *Application Express* and Ashton-Tate's *dBASE Assistant*, with their products. Yet with all the power and control that applications generators offer, people persist in reinventing the wheel, writing new database applications from scratch. Why? Because they want total control, or they want to create functions that go beyond what the applications generator can offer.

Development tools for nondatabase applications have been a flat market, or even a nonmarket. Go ahead, name a generalized applications generator for 1-2-3. I couldn't think of one either, although there are several on the market. They are, unfortunately, the answer to a question that no one is asking. It all comes down to the way applications are developed. Database ap-

plications tend to be reflections of known problems, data, input, and output. How many ways, after all, can you do an address list? Most spreadsheets, however, involve a pursuit of the unknown. Even fundamental applications such as budgets and balance sheets tend to pick up the personality of their creator. Overall, applications generators do a poor job of accommodating something as tenuous as individual style.

COMPILE ERGO SUM Project the desire for individual style to everything that spreadsheets and databases can't do, and you're looking at the market for programming languages. In fact, rather than replacing languages, powerful applications programs have only whetted the appetite of users by showing them what is possible.

Multiply that by the sheer number of PCs, and it's easy to see why languages are having their best year ever.



The other major factor in the languages success story is the Turbo/Quick phenomenon. Borland's Turbo Pascal revolutionized the language market by integrating the compiler, editor, and syntax checker into one tightly knit, fast-operating unit. It made Pascal as convenient to use as interpreted BASIC, but with the speed, small code size, and portability that only compilers can offer. It also single-handedly saved Pascal from oblivion. At the time, Pascal was firmly in the hands of the academics and was the preferred one-upmanship language of those who wished to show their superiority. It wasn't especially useful because as a teaching language it was weak on record-oriented I/O. Borland's version contained extensions that made it a useful business language.

Meanwhile, ordinary citizens wrote thousands of programs in interpreted BASIC, mainly because there was no other way available to them to get the job done. BASIC, after all, was free with the PC. If they needed the code to be faster, more robust, or more suitable for distribution, there was always the Microsoft/IBM BASIC Compiler.

Then Microsoft came up with QuickBASIC. It embodied the same conveniences as Turbo Pascal, but with a language more accessible and more highly tuned to the PC's capabilities. Programs written in BASIC finally began to achieve a degree of respectability. As more and more users flocked to the convenience of QuickBASIC, the elitists and purists were drowned in a sea of fast, inexpensively developed applications that worked.

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EDITOR'S SCREEN

It was only natural that Borland would enter the market with Turbo Basic. Competition dignifies and strengthens a market. But the real race was to see who could develop the first integrated C compiler. Borland got there first, with Turbo C, but Microsoft followed in hot pursuit with Quick C.

So now users have a choice of fast, efficient development environments, in their choice of languages. These products are selling like hotcakes, in the face of the most powerful applications programs ever made.

While these languages have been getting turboed and quickened, they've also gotten substantially better in the size and efficiency of the code they produce. So good, in fact, that they've created major headaches for those of us whose job it is to benchmark-test compiler performance. The purpose of a benchmark test is to do "nothing" and measure how long it takes. Doing "something" often invalidates a benchmark test, because as soon as you go to a disk, screen, or printer, you create hardware dependencies that can skew the results. Language designers build in optimizations that detect the do-nothing portions of programs and simply skip over them. Our benchmark test designers think up ways to outfox the optimizers.

From either point of view, you win. These products produce fast, tight code.

The special-purpose compilers for *dBASE III* are well entrenched, and we're seeing the emergence of compilers for *1-2-3* templates. One, *The Baler* (actually a reemergence; it was way ahead of its time 3 years ago), by Brubaker Software, generates BASIC code so that you can integrate and compile in your own custom code. Another, *@Liberty*, is a full compiler. With more than 2 million *1-2-3* users out there, this market needs advanced language tools.

Language designers aren't resting on their laurels. The next few years promise to be the most exciting time since the inception of the computer industry. You'll be seeing incredible power, versatility, and ease of use. Current methods of program development and debugging will look primitive.

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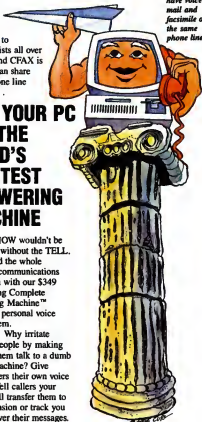
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CIRCLE 510 ON READER SERVICE CARD

■ JOHN C. DVORAK

ET TU, OS/2?



Dvorak comes not to praise OS/2 but to bury it. To like or not to like: that is the question everyone will be faced with. Dvorak has made up his mind.

The battle lines are drawn between two distinct groups in the PC community. *OS/2 da! OS/2 nyet!*

This battle is no small skirmish, either. The OS/2 controversy focuses on two issues. Issue number one is its use of the 80286 instead of the 80386. The second issue is the price. Everything else—performance, size, windows, etc.—is secondary.

Let's start with the chip issue. We always have to remember that the chip of choice is the 80386. Why? Because in protected mode (the mode with all that directly addressable memory) it will run 8086 code without modification. The 80286 will not. So you can't run your favorite old software under OS/2 unless you go into the so-called compatibility box (rhymes with penalty box "for high sticking!") and run it as a standalone program exactly as though you were running under DOS. You get none of the OS/2 benefits, no multitasking, no nothing. Why bother to change to OS/2 if this is the case? Well, it's assumed that you'll trash all your old software and spend extra dough for OS/2-compatible software, which will undoubtedly be more expensive than DOS software because the market for OS/2 is limited to the well-heeled Fortune 500 user.

The irony of the predicted high prices of this new generation of software is that OS/2 provides tons of programmers' tools that should make programming easier and thus lower the price of OS/2 software. Are things starting to smell a little rancid just about now?

The real gotcha to this scene, though, is seldom discussed by the micro world: Systems Application Architecture, better known as SAA. This is IBM's new programming-rulebook / user-interface / universal-compatibility solution. The idea is that with a rigid structure of standard calls, routines, and rules, a program that is SAA compatible will run exactly the same on a PC AT as it will on the big mainframe. Furthermore, a spreadsheet program will have the same interface as a database-program if both follow the SAA rulebook. Even the graphics will be universal, using the IBM mainframe GDDM graphics standard, which is the kernel of OS/2's presentation manager! IBM has made SAA one of its top priorities in the years ahead. The company has determined that OS/2 will be the beachhead for its first implementation of the SAA solution.

Because the 80386 impinges on the performance of its mini-mainframe (aka the

9370-20) and its System/36 and System/38 minis, IBM chose to have Microsoft design OS/2 to be an 80286 operating system. This is especially important when one sees the impact of SAA, which will create program compatibility up and down the IBM line. Heaven forbid the grand scheme would eat into the high profits of the heavy iron! Then, to make sure that only the big boys get to play in this arena, they price OS/2 beyond the budget of the single user or even the budgets of most small businesses. Even if they could afford it, can they afford to toss out all their applications and buy new, more-expensive ones?

Well, we sure wouldn't want a bunch of everyday hackers sticking their noses into all this, would we? Heck, they might mess it up somehow.

Golly, they may even make a cost-effective system. A low cost per MIPS is what IBM has always been known for in the mainframe market. It's funny how it doesn't want to play the same game in the low end.

No matter, you'll see the results of all this soon: double standards, havoc, confusion, debate. None of this would have happened if OS/2 were an 80386 operating system and were reasonably priced so that everyone used it. So ask yourself: Why were these decisions made, and who is best served by chaos in a market dominated by cheap clones? IBM, that's who. It's good to see everyone going along with the program.

Welcome to the beginning of the end. Or maybe it's the end of the beginning. We'll see.





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CIRCLE 245 ON READER SERVICE CARD

■ JOHN C. DVORAK

INSIDE TRACK

Some shows are hot, some are not.

Weeks have passed and I'm still trying to get over attending the 5th Anniversary of **PC Expo** at the Javits Center in N.Y.C. PC Expo is a show for "volume buyers" of microcomputers and software.

Description of show (choose one): (a) just plain dull; (b) deadily dull; (c) duller than dull; (d) dullsville; (e) too dull to rate. I've never seen anything like it. It must be because the attendees at this show aren't interested in anything but contracts. Surely they aren't micro enthusiasts, rather purchasing agents cum bean counters. **Nobody was as dull as this crowd—ever.** Get this: some company handed out \$15 passes to the Lime-light disco—a New York hot spot—and *nobody* took the tickets. I'm telling you this because if you wonder why your company sometimes comes up with some peculiar buying decisions, it may be that these guys are the reason. Get more involved, dear reader! Anyway, I sure hope it's not a virus or something that causes this condition. (The answer to the quiz, by the way, is e—too dull to rate.)

On the other hand, the **Seybold Desktop Publishing Conference** in San Jose a month later was filled with excitement, as Phoenix Technologies (the great cloner of the IBM BIOS) has **cloned Adobe's PostScript**. PostScript, as you recall, is the page-definition/character-definition programming language used as an interface between computer and printer to produce lovely (yes, lovely) typeset-quality images from laser printers or anything else running the PostScript language.

Rumors were flying that dozens of companies are working on PostScript clones. PostScript will now be cheaper and will begin to show up on all the laser

printers. Until now, Adobe was charging as much as \$500 per printer to use the PostScript software. This is in addition to a \$250,000 OEM fee.

The biggest secret in the industry and one that will be vehemently denied is that Microsoft is working on a PostScript of its own, to be dubbed **Microsoft PostScript**. The company hopes to add this to its **cash cow division** as a licensed product. Now you know why IBM dropped its own page-definition language and chose PostScript some months back. It didn't do this so it could pay \$500 a printer. And it sure isn't going to pay tribute to Phoenix, a company that is largely responsible for the success of the clone business.

Microsoft may be needed if the forthcoming **PostScript wars** emerge. All the PostScript software I've heard about emphasizes "enhancements." This means a lot of different and incompatible enhancements. And that always spells disaster as the NIH (not invented here) syndrome takes over.

Genuinely Interesting Anecdote Dept.: I was having a beer with Autodesk's talented product manager for AutoCAD, John Forbes, as he was promoting the new (and superb) AutoShade enhancement for the AutoCAD system. AutoShade, for \$500, turns those wireframe images into surfaced and shaded on-screen models like nothing I've ever seen on a micro. If you use AutoCAD, check it out.

Anyway, we were discussing screwball uses of AutoCAD, and Forbes said that the most unusual use was by some **monk who designed stained glass windows** with it. "We were going to do a story on the guy and our research turned up the fact that he was using a bootleg copy!" exclaimed Forbes. "A man of

God, yet." Hey, bootleggers are everywhere. Forbes figures that there are at least **40,000 bootleg copies of AutoCAD** out there. He feels that Autodesk updates the product so often that someone who uses it seriously will eventually have to buy it. A refreshing attitude.

Genuinely Interesting Software Dept.: If there's an inexact science that lends itself to computerization it's forecasting. My favorite forecasting story is about the software program owned by the weather service that runs on a Cray and can predict the next day's weather perfectly. Unfortunately, it takes **two days** to run the program.

Forecasting in business is worse. Unfortunately, everyone has to do it, especially around budget time. If you need **great forecasting software**, then look at **Wisard** from Wisard Software Corp. (P.O. Box 19730, Green Bay, WI 54307; (414) 436-2341). This software won an international competition using real-world data to predict missing but known information. It has been used in intra-day stock trading to predict the movement of a stock—ten sampling periods **in advance** of the move! Its proprietary algorithms may be the best in the business. If anyone comes up with interesting stock market analysis stuff using this program—send me a memo, pronto! Prices start at \$99 for a Lotus add-in version. I recommend the **Wisard Professional** at \$249. This looks like great stuff. I can imagine all kinds of uses.

Finally. Another nifty package I've seen recently is **CMS—Collection Management System**, from Koch Software (11 W. Cottage Dr., Bldg. G, Arlington Heights, IL 60004; (312) 398-5440). It's what all accounts receivable programs should be—a computerized collection agency. CMS even sends out the dunning notices and everything. And it interfaces to all popular G/L systems. A great idea whose time is **overdue and payable**. ☐

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CROSSTALK

■ JIM SEYMOUR

BETTER SOFTWARE INTERFACES

In the second part of a look at user interfaces, Seymour explores current software interfaces and the features that make good interfaces work.



Drawing from the collected wisdom of software and hardware designers, long-time PC users, *PC Magazine* editors and columnists, and others, let's continue our look at better user interfaces. This time: software interfaces.

Paul Heckel has thought a great deal about how we should interact with software—or rather, how software should interact with us!—and has put many of his best ideas down in an extraordinary little book, *The Elements of Friendly Software Design*, published in 1984 by Warner Books.

Paul has written and sells a program, *Zoomracks*, which exemplifies many of those ideas and is almost universally known and admired within the PC industry—though Paul chuckles that he's only sold about 500 copies.

Zoomracks lets users search almost instantly through what appear to be great piles of disjointed information. But other programs allow that kind of searching. Paul's touch is evident in the way *Zoomracks* displays results when there's not enough room to show a whole filecard: by removing vowels to compress text. Thus we might see "f u c n d r t s, u c n l m to prgrm"—perfectly comprehensible (if inelegant), yet taking up far less space on this display than the full text.

Why don't we see that kind of feature in other PC software? If you shrink an on-screen window containing a database application, the system could abbreviate the content intelligently instead of just truncating it. If you design a printed report with just 10 columns for CITY NAME, where

the actual city names are longer they should appear in abbreviated form. And to extend the concept, the system ought to scale down type sizes (optionally, by dialog selection) when a *Microsoft Windows* window is reduced below a certain minimum size.

DEVELOPMENT TOOL Bill Atkinson's new *HyperCard* program for the Macintosh incorporates that Heckel-style free-form approach (though not the text compression) in the most genuinely new and useful kind of software seen in the last couple of years. Atkinson has built a program that is both an application in its own right and also a development tool for the nonprogrammer. *HyperCard* becomes an Erector set in which you build your own applications.

Because the Mac's hardware supports a rich software interface, and because the graphics possibilities of the Mac encour-

age experimentation with software interfaces, much of the most interesting interface work we've seen lately has appeared on the Mac.

Jim Edlin's word processor for the PC, *Wordvision*, was one of the first serious attempts to improve PC interfaces. In some ways, such as displaying, in a dynamically changing graphic, how page margins will appear in the final document, *Wordvision* has yet to be topped by current word processors. Now Edlin is working mainly with the Mac, and he finds a lot to admire in other Mac programmers' work.

KEYBOARD HARMONICS "There are so many nice things," he says. "In *Adobe Illustrator*, for example, there's a 'communicative' Undo label, which keeps telling you what it's primed to undo at the moment: Undo Rotate . . . Undo Scale . . . Undo Move.

"And also in *Adobe Illustrator*, an example of why 'chording keyboards' are going to be important. It seems strange and out of context at first to use a keyboard this way. But for example, you can press Command + Space to change the arrow-pointer to a zoom-in magnifying glass. Then add a third finger over on the Option key, and the glass changes to the full-screen, zoomed-out version. Release all three keys, and you're back to the arrow.

"Once you get used to this initially bizarre innovation, it leaves you making beautiful music with your productivity.

"And tied into this design is a whole bunch of communicativeness Adobe has built into its gallery of cursor icons.



■ JIM SEYMOUR

Changes both gross and subtle (such as the disappearance of the arrow's tail after you've clicked the first point in an operation that requires mouse-clicks on two different points) keep you informed on what

you're about to do without having to move your eyes away from the relevant points on-screen."

PC Magazine West Coast editor Jared Taylor wants deceptively simple but actu-

ally very profound improvements in software interfaces and feature sets. "All programs require repetitive tasks. I want a built-in macro feature, with a 'learn' mode such as PC Excel has, rather than having to fiddle with ProKey.

"And I want my choice of what goes on which menus. This is an example of the kind of 'soft' user interface we need. I want the ability to redesign the whole menu tree. Some menu trees have a lot of choices at the top and don't go very deep. Some have few choices at the top and go many layers deep. I want to be able to arrange the tree entirely to my liking and get at any of the commands in a sequence of my choice. If I want to do something eccentric and put the print options in the graphing menu, I want that option.

■ Jim Edlin's word processor for the PC, *Wordvision*, was one of the first attempts to improve PC interfaces.

"Taking that a step further, what about modular programs where, to get faster loading or to save more memory for data, we get to choose which parts of a program are used? If I never use the help, graphing, or database parts of a spreadsheet, I want the option of leaving them out."

These are just a few of the hundreds of ideas for better software interfaces I've collected over the past few years. There are far too many for a column: it's a book-length job, and I may yet write that book.

Many of the best ideas I've picked up have come from PC users who've gotten tired of the problems of their programs and have figured out how they *ought* to work. If you've got some ideas on how software interfaces can be improved, send me a note (PC Magazine, One Park Avenue, New York, NY 10016). If enough good ideas show up in the mailbag, I'll pull the best of them together in my column in a couple of months.

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US Robotics 1200B \$ 109

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Ventel 2400B \$ 399

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■ STEPHEN MANES

THE DUMPTY DICTIONARY, VERSION 3.0



Confused about the latest high-tech buzzwords? The return of a giant in the field of computer lexicography will add new meanings to your existence.

The late consultant H. Dumpty's pioneering definitions of computer terms have twice appeared in this space (*PC Magazine*, Volume 4 Number 7 and Volume 5 Number 18). Unwilling to accept the finality of the untimely demise of "The King," both of our readers have egged us on to find more of Dumpty's prescient work. Our thanks to the Dumpty Estate for loaning us the rare (80-MHz) crystal that opened the Micro Channel to the Great Ovoid Spirit; our apologies for its great fall onto the subway tracks.

THE CUTTING EDGE

Extended memory RAM above the 640K limit that isn't expanded memory.

Expanded memory RAM above the 640K limit that isn't extended memory.

Enhanced expanded memory RAM above the 640K limit that isn't extended memory but is a superset of . . . oh, what do you need to know for? You'll probably never use it anyhow.

Gigabyte A quantity of memory so vast that if offered on a hard disk, no user could possibly fill it in less than a week.

Terabyte A quantity of memory so vast that the only humans who can fathom it are programmers writing software that will end up requiring more.

The 640K barrier What all the TSR programs you want to run would break if DOS let them.

Virtual machine The computer you really want at a price you can afford.

Wait state The perpetual condition of users contemplating upgrades.

Error correction Version 1.1.

HARDWARE

Keyboard An input device beset by frequent ugly devolutionary mutations.

Alternative input device A partial replacement for the keyboard; e.g., mouse, tablet, light pen, voice recognition board, dictation machine, secretary.

DASD Acronym for "Dumb And Stupid Disk"; overpriced and/or underperforming IBM storage device.

Scanner A quick and easy means of appropriating the entire history of art, illustration, photography, and literature without bothering to pay for it.

Supertwist A laptop computer display readable on an airplane only by performing its namesake maneuver in order to catch the seat light's feeble rays.

Backlit A laptop computer display readable on an airplane for only 10 minutes after the 3-hour wait in the terminal drains both you and the battery.

Gas-plasma A laptop computer screen

readable on an airplane only in the rest room, provided the shaver outlet works.

Discard A PC-bus board in a Micro Channel world.

Network What next year is always "the year of" and will be until at least the turn of the century.

Connectivity FantasyLAN.

Installation A day's entertainment; from the verb "to stall."

Standard Just like something else, almost.

SOFTWARE

User interface The creative employment of a computer display and keyboard to hopelessly confuse computer novices.

Graphics interface The creative employment of a computer display, keyboard, and mouse to hopelessly irritate computer veterans.

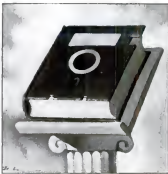
Pull-down menu The ultimate refinement of the "overtightened roller-blind" metaphor.

Look and feel The legal theory that Lotus Development Corp. invented the spreadsheet, the video display, the keyboard, algebra, and the Arabic number system.

Utility A genuinely useful program whose functions should have been included free in the far-more-expensive program it is meant to supplement.

Macros Former ruler of the Philippines.

Tiled windows An Italianate architectural conceit of the sixteenth century, mistakenly installed on Bill Gates's "House of the Future."



■ STEPHEN MANES

Windows applications Gargantuan beasts, mostly mythical.

Typeset-quality font A means of making neatly-typed correspondence look like badly-designed junk mail.

Downloadable font An addictive letter form distinguished by difficulty of use and free distribution by fellow junkies.

Presentation graphics Nonprescription sedatives.

Express With "dismay," what users do when they find out about Lotus's monopoly on binary and error-corrected communication via MCI Mail.

1-2-3 The ease with which one can get non-copy-protected software from virtually all vendors except Lotus.

Hypertext California "mellow" lingo for "database."

SUPPORT

Solution A bundled package of stuff you can get for thousands of dollars less as separate items.

Mail-order A means of distribution whose low prices are often offset by prompt, courteous, competent service.

Toll-free support line An 800 number that's always busy.

Priority support line A special 800 number whose answering machine promises to return your annual fee the moment the firm emerges from Chapter 11.

MODERN TIMES

Real mode Runs programs that really work.

Protected mode Safeguarded from running programs that really work until programmers figure it out any day now.

OS/2 Protected mode's imaginary friend.

Compatibility box The cage where OS/2 will isolate dangerously unruly, uninhibited, and ill-behaved old DOS programs with bars of sturdy marshmallow.

Micro Channel The PS/2 bus, re-named to woo new-age Macintosh users of "MacLaine Ethernet" programs.

Model 25 The PS/2 line's jr member (but don't say that among IBM personnel).

Model 30 PS/2-284. (Formula: PS/2-286.)

Model 50 A slow hard disk in a pretty package.

SNA Shortened form of "SNAFU."

SAA (Pronounced "Sure...") Whatever your IBM salesman says it means this week.

NIH Not Invented Here; IBM term for high-quality software.

M*A*S*H A 15-year-old TV show based on 35-year-old events and now in its umpteenth year of reruns; used to promote IBM's forward-looking line of new computers.

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•SECTOR NOT FOUND
•FILE ALLOCATION TABLE BAD
•DISK ERROR READING FAT
•DISK NOT READY
•INVALID DRIVE SPECIFICATION

•DATA ERROR
•GENERAL FAILURE
•ERROR READING
•WRITE FAULT
•BAD SECTOR

•NON-SYSTEM DISK OR DISK ERROR
•READ FAULT
•BAD DATA
•ABORT, RETRY, IGNORE
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No matter what they say, every one of these messages usually means: data loss due to hard disk failure. Part of your business is suddenly missing-in-action. So you call technical support. Pay for unnecessary repair or replacement. Pay overtime to attempt recovering or reconstructing as much of the scrambled information as possible. Spend valuable time soothing the feathers of irate customers because one of your computers is "down."

Think about it a moment: how much have these disguised hard disk error messages already cost you in unrecoverable data, time and torture? Now for the shocker: your average business user sees these disguised hard disk failures many times each year!

The good news is:

Disk Technician™ and Disk Technician+™ Automated AI Software Systems virtually eliminate hard disk problems for IBM PC, XT, AT and true clones. There is simply no other program that can deliver what Disk Technician™ does. Over 7 years' painstaking R&D were needed to bring our revolutionary system to you.

Disk Technician™ is preventive maintenance software that repairs and maintains hard disks by predicting and correcting failures before and after they happen — without removing programs and data!

It's easy to use: requires absolutely no technical skills and less than 60 seconds of operator time daily. It runs automatically and unattended. Anyone who can press ENTER can use it.

The Power of Disk Technician™

Disk Technician™ predicts, detects, repairs and recovers hard disk data problems on the most fundamental level possible: that of the single bit soft error. This unique ability is used as an early warning mechanism that allows Disk Technician™ to accurately predict which areas of the hard disk will eventually cause problems — problems unknown to you until it is too late. Only Disk Technician™ is able to find and correct marginal areas before they affect your valuable data. And your bottom line.

Disk Technician™ keeps a history in its database of failure patterns it detects. The astounding accuracy of Disk Technician™ and the long-term reliability of your hard disks depend on decisions reached by its artificial intelligence (AI) considering data gathered from previous tests it has performed on your system.

Million dollar mainframe reliability for PCs?

Disk Technician™ uses special proprietary write/read testing to identify marginal bits and/or continual dynamic changes. Then, comparing current test results with its database of previous failure patterns, Disk Technician™ AI makes an early warning decision as to whether or not these errors will cause data loss.

The power of Disk Technician™ daily testing, AI, precision accuracy and history database virtually assures million-dollar mainframe reliability for PCs.

All this and power "glitch" protection, too?

SafePark™ memory resident software program — included — works with all of your programs all of the time to prevent destruction of your data from static electricity, turning power on-and-off, brownouts, surges and spikes. When these "glitches" occur they can write garbage into anything the disk heads happen to be located over — sometimes wiping out an entire disk! After 1 - 15 seconds (user adjustable) of hard disk inactivity, SafePark™ automatically moves the heads over a "safe zone" created by Disk Technician™. Once the heads have been moved — which will almost always be the case — and a power glitch occurs, any damage will be confined to the safe zone: protecting your valuable data and programs.

If reliability, cost and downtime are important to you — daily use of Disk Technician™ is a must. Because the time to prevent disaster is before it happens!



Choose Disk Technician™ for hard disks up to 32 megs with MFM controllers. \$99.95



Choose Disk Technician+™ for hard disks over 32 megs, logical or partitioned drives, or RLL controllers. \$129.95

★★★ NOW READ WHAT THEY HAD TO SAY: ★★★

* **New York Times:** "Disk Technician seems like a product every owner of a hard disk should seriously consider buying and using daily for preventive maintenance. Think of it as dental floss for your computer."

* **PC Magazine:** "Prime Solutions claims its Disk Technician can prevent hard disk errors, repair even left-for-dead hard disks, and recover lost data — all automatically and without any technical skills on your part. Sound too good to be true? I thought so too. But after witnessing a few minor miracles and a major miracle or two, I'm a believer. This \$99 software may be the best investment you could ever make."

* **John C. Dvorak:** "If you're one of those souls who are plagued by hard disk problems, then take a look at Disk Technician from Prime Solutions."

★★

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Stephen Maras, PC Magazine

"...the Breakthru 286 was the card of choice."
PC BusinessWeek (Rated #1)

"...Breakthru 286 is a good value and a quality product backed by effective support."

Don A. Griffin

The Newsletter of the AutoCAD User's Group

"The PCSG Breakthru 286 achieved the best performance results of the caching boards tested."
Ed Merck, PC Tech Journal (Rated #1)

"The 12-MHz Breakthru 286-12 speedup board is the fastest of those tested, but not the most expensive. On a dollar per-hardware basis, it could be called the cheapest board available for an XT."

Mark Welch, InfoWorld (Rated #1)

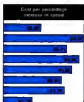
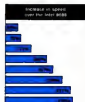
Think You Need an AT?

Make Your IBM PC Faster Than an AT in Just 5 Minutes!

Accelerator Cards: Speed and Value

Speed figures are correlated results from 10 tests of CPU performance (See Accelerator Boards Special Report, December 1, 1986.)

- ☐ Microspeed Fast 88 \$149
- ☐ Microsoft Mach 30 \$395
- ☐ Univision Dream Board \$512
- ☐ Orchid Turbo EGA \$945
- ☐ ST&D Standard 286 \$995
- ☐ Classic Speedpack \$995
- ☐ Orchid PC-Turbo 286 \$1,195
- ☐ Breakthru 286-12 \$595



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Breakthru 286-8MHz-\$395
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LIGHTNING™—FREE with Breakthru
speedup hardware—\$89.95 purchased separately

We are excited about our three speedup products. You probably know about our Lightning disk access speedup software that was awarded PC Magazine's Best of 1986 award (see box). After the smashing success of Lightning, in late '86, we

guaranteed the Breakthru 286 board to be literally the most advanced, fastest, most feature-rich board available. The runaway success it has enjoyed truly proved that assertion. Now we go ourselves one better with the Breakthru 286-12. This new board has the clock speed cranked up from 8 to 12 MHz for speeds up to 10.2 times faster than an IBM PC. It is 50% faster than an 8MHz IBM AT, and up to a whopping 1,000% faster than a regular PC.

HERE'S WHY THESE TWO BOARDS ARE SO SPECIAL.

First, they install so easily. A half-slot card means you don't even have to give up a full slot. What's more, unlike competing

products it works in the Compaq Portable and most clones. Easy diagrams show how you just place the card in an open slot, remove the original processor and connect a single cable. There is no software required. From that moment you are running faster than an AT.

Second, they are advanced. The BREAKTHRU 286 replaces the CPU of the PC or XT with an 80286 microprocessor that is faster than the one found in the AT. Has a 80287 math coprocessor slot for numeric intensive applications. A 16K cache memory provides zero-wait-access to the most recently used code and data. Speed switching software allows you to drop back to a lower speed on the fly for timing sensitive applications.

Third, you have full compatibility. All existing system RAM, hardware, and peripheral cards can be used without software modification. Our boards operate with LAN and mainframe communication products and conform to the Expanded Memory Specification (EMS). Software compatibility is virtually universal.

Faster and smarter than an AT - PCSG guarantees it.

Fourth, these are the best. There are several other boards on the speedup market. We at PCSG have compared them all, but there simply is no comparison. Many cards offer only a marginal speedup in spite of their claims and others are just poorly engineered.

We are really excited about these products. PCSG makes the unabashed statement that the BREAKTHRU 286 card represents more advanced technology than boards by Orchid, Quadram, P.C. Technologies, Phoenix...we could go on. Breakthru 286 is undisputedly the turbo board with the biggest bang for the buck. And we include FREE the \$89.95 acclaimed Lightning software. Call today with your credit card or COD instructions and we will ship your card the very next day.

But, no speedup board cuts disk access time in half

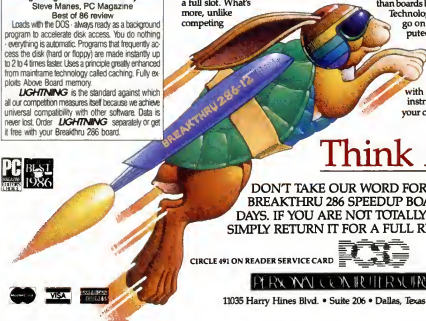
LIGHTNING

software can - \$89.95 or FREE w/Breakthru

"Lightning is almost mandatory..."
Steve Maras, PC Magazine
Best of 86 review

Loads with the DOS - always ready as a background program to accelerate disk access. You do nothing - everything is automatic. Programs that frequently access the disk (hard or floppy) are made instantly up to 2 to 4 times faster. Uses a principle greatly enhanced from mainframe technology called caching. Fully exploits Above Board memory.

LIGHTNING is the standard against which all our competition measures itself because we achieve universal compatibility with other software. Data is never lost. Order **LIGHTNING** separately or get it free with your Breakthru 286 board.



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Lucid 3-D is priced to sell at \$199, but we want thousands of people using Lucid everyday, all over the world. We invite you to be a part of that group. The reason we are offering Lucid for only \$99, on a sixty day return for a full refund, is simple. Preliminary user testing of the product produces the same results over and over. People tell us they would never work without Lucid 3-D again. Even folks continuing to work with 1-2-3.

Memory Resident

That's because the idea of a memory resident spreadsheet makes sense, one that you can pop-up instantly while working in your word

way we dreamed a spreadsheet would function. Everyone who has seen it says things like, "Lucid 3-D is how software of the 1990's will look and perform," or even more to the point "This is the way I thought a computer should work." You'll see. Lucid is exciting.

way. Users say "It is so intuitive that I really don't need a manual." That's because we use something we call a visual command menu. Jim Seymour, the noted PC columnist, talking about Lucid in a recent article said that, "If there ever was an interface idea so good it ought to be stolen and widely used, this is it."

What he was talking about is a new menu approach that follows a simple design concept: it is easier to recog-



FIG. 2 Here we are, instantly. Notice the lower left corner showing we are on level 2. You can go down or up. (See next page)

processor or any other program. Lucid lets you cut anything on the screen and paste it right into Lucid, or cut anything from a Lucid worksheet and paste into the application below. You can even run Lucid on top of 1-2-3 if you like, and cut and paste information from one to the other, including formulas.

Lucid 3-D was developed over the past two years with countless, exhaustive hours of planning and programming to produce something spectacular. This is a product that works the

multi-dimensional. Any cell of the spreadsheet can contain a complete other spreadsheet that you can access with a single keystroke. It is as simple as the pictures show. And you don't have to write formulas to do that. All you do is go look at the other file, navigating through easy, point and shoot directories. When you come back up (with one key) the link is made automatically for you.

Everything about Lucid works that

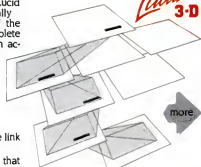


FIG. 1 Let's get the detail on those ad costs. Just move the window to that cell and press one key (grey +).

What Makes it so Special

In the screen examples you can see Lucid is really

nize than it is to remember. As choices are made on a menu that take you to lower levels you always can see exactly where you came from and where you are going. The complete menu path is always visible. You cannot get lost several levels down. This means you never have to remember a command, you just flow right to it.



Any cell can contain a complete other spreadsheet that you can access with a single key.

Plus, no matter where you are on a menu or what you are doing, just press function key F1, and you will get a help screen specific to that command or action. Or if you want to know about any subject you can pop up an index of over 400 topics and select the one you want.

Notepad Behind Every Cell

Another 3-D feature is that any cell can also contain a multiple page note that you instantly access with a single keystroke. You can write



FIG. 4 Now instantly we are on level 3. By the way, each level is a different spreadsheet. Move to Dallas Morning News and press that button.

notes, memos or letters that relate to your work, save them as individual files and even print them separately or with your spreadsheet.

Speed

Lucid 3-D is truly revolutionary. It is fast, fast, fast! It is incredibly quick in performing calculations because it doesn't recalculate every cell every time you insert an entry. Instead, it only recalculates the specific cells that are affected by your change. This is called minimal recalc. Lucid also has a remarkable innovation called background recalc in which you are given control of the cursor the moment calculations affecting your viewing screen are completed. Other calculations you don't see continue on in the background during the next commands. The end result of this powerful combination is you rarely wait for a recalculation with Lucid. You find out what instantaneous is all about.

Lucid Learns

Lucid 3-D also lets you teach it any

combinations of keystrokes so that involved sequences can be

done with single keys. Plus more than just remembering keystrokes, Lucid allows you to create Macros with loops, procedures and conditional branching amazingly all done automatically with simple menus. You can create your own menus that show the new features you have taught it. Another great feature is you can make your custom menus work like Lucid where one choice can take you down a level to a whole new set of choices. What's nice is that they will work from one spreadsheet to another.



FIG. 3 We want more detail, so let's go to Newspapers. Just press the Grey + Key

“The best idea I've seen for a spreadsheet in years.”

Jim Seymour, Columnist, PC Magazine, PC Week

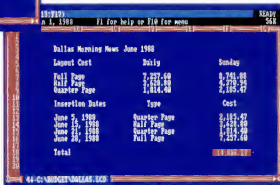


FIG. 5 Look! Level 4. You can work and make changes if you like. Now one button (grey -) takes you back instantly a level at a time. There's no limit on how big a model you can build.

Mouseability

Lucid 3-D was designed for both keyboard enthusiasts and mouse lovers alike. You can take your pick. Designed around the mouse from the ground up, the interface is smooth and natural. You select files to load from directory lists. Everything is point and click. What's more, any Lucid 3-D menu selection can be "moused" and the response time is "right now" instead of the sluggish "a little bit behind you" feel of add-on mouse menu systems like those you've seen with 1-2-3.

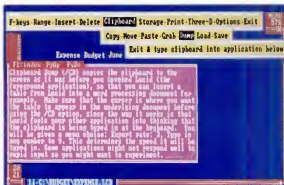


FIG. 6 We need those budget figures in the Word Perfect letter we are writing. Clipboard Dump does it right now.

A window pops up with a library of function names you can page through with the mouse. Select, click and it's in the formula with no typing required. You even have a label window that you can fill (from the keyboard) with favorite labels and names so that you can insert them later with the mouse. There's even a pop-up calculator to insert numbers so you don't have to go to the keyboard very often.

It really permits that feeling of becoming one with your work. Lucid 3-D has windows of user defined range names as well as the macros named by the user that can be selected just by pointing and clicking. Icons that are easy to grab with the mouse let you resize and move the spreadsheet window with the ease you would expect. Plus you can go anywhere on the sheet by moving the mouse and clicking on the spreadsheet borders. And remember Lucid is designed so that any of those features are done with or without the mouse easily and quickly.

Audit

When you are staking a big decision on information gained from a spreadsheet you need to be certain that you have made no mistakes. Lucid offers five audit displays and printouts.

Masterwork

We could go on at great length about all the features and innovations in Lucid, but Lucid is more than a bag of features. What is most important is the pride and craftsmanship that went into its creation. It is a master-

FIG. 7 Here it is right in Word Perfect for any word processor) just like you typed it. You can go the other way just as easily.

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Enclosed are my estimates for the June 1988 Budget. So take a look at them, and see if they agree with your ones.

Expense Budget June 1988

Advertising	270,395
Administration	500,423
Operations	500,423
Manufacturing	174,000
Research	902,411
Total	1,954,907

Get back to me as soon as possible.

Thanks,
 James Johnson

C:\BUDGET\JOHNSON.WP

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work. The overall feel is tight and polished. In fact, Paul Somerson, executive editor of PC Magazine, used one word to describe it, "Slick".

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Apple strikes to meet the
PS/2 Model 80 challenge and take a healthy slice
out of Big Blue's business.



COVER STORY



FOR THE SERIOUS PC USER in business, until recently the ongoing Macintosh-versus-PC debate was theoretical—if theory meant winning arguments and reality meant opening corporate pocketbooks. A couple of Macs might have found their way into the graphics department, but there was never much serious thought given to standardizing on a machine that had no hard disk, came with a monitor that you could hide behind a Stephen King paperback, and made a funny bing-bing noise when it booted up.

PC Magazine faced off the original Mac against the IBM PC-XT in the July 23, 1985 issue (Volume 4 Number 15). The cover photo showed them both together, with the Mac screen displaying the mes-

sage, "Hello"; the PC screen, "Get lost." A close comparison found them pretty much dissimilar equals, the Mac's 16/32-bit chip offsetting the 8/16-bit XT's color monitor and hard disk. Mac sales didn't soar, however.

in power and much closer in purpose, despite their different operating systems. If the underlying theme 2½ years ago was "know thine enemy," this one could be "partners together." Both computers boast full 32-bit CPUs, big hard disks, dazzling 640- by 480-pixel color displays, and connectability for communications and file sharing among an increasing number of similar applications (*PageMaker*, *Microsoft Word*, *Excel*). And now Apple—made respectable by John Sculley, the Laser-Writer Plus, and most recently the Mac II—is poised to move out of the desktop publishing niche and into general circulation.

Is Apple ready for the gray flannel mainstream? Does IBM finally understand the importance of graphics? *PC Magazine* as-

APPLE CUTS IN ON IBM

sage, "Hello"; the PC screen, "Get lost." A close comparison found them pretty much dissimilar equals, the Mac's 16/32-bit chip offsetting the 8/16-bit XT's color monitor and hard disk. Mac sales didn't soar, however.

The new generations introduced by Apple and IBM this year are light-years ahead

signed columnists and contributing editors John C. Dvorak and Jim Seymour, industry gurus with feet planted firmly in both camps, to poke, prod, and benchmark-test the Mac II and PS/2 Model 80 using the best software available for both machines.

Their reports follow.





DOUBLE STANDARD

For years, IBM and Apple have
competed for the hearts and minds of business users. The new Mac II
makes the race closer than ever.



COVER STORY JOHN C. DVORAK

Everyone was abuzz. A year before its announcement, rumors began about the new computer from Apple. The experts said that the new mouse-based marvel was what Apple finally needed to take on IBM in the business market. It was easier to use than an IBM PC, more powerful than any IBM (according to the Apple boosters), and pretty, too. The software, with its icons and windows, was much more innovative and advanced. The media went gaga when Apple first showed the machine. One writer for a trade weekly told *Business Week*, "It blew me away."

That was in 1982, and the machine was the Lisa, now extinct. The Lisa was the darling of the press for a few months, and you would have thought the world belonged to Apple. Too bad the boosters of the machine couldn't find enough dough in their pockets to buy one. Enthusiasm deteriorated when the incredible price tag of \$10,000 threatened to show up on American Express tabs. The Lisa was just too expensive.

Also, the machine was an incredible dud. In its waning days the Lisa was renamed the Mac XL in hopes of dumping the last few that were buried in the warehouse. The last Lisa was shipped in April 1985.

Times have changed since then. The miracle of the Macintosh saved the day. The Macintosh, a machine not that different from the Lisa, was released by Apple on January 24, 1984, as Steven P. Jobs's last hurrah. With another forceful publicity boost, the company wowed the crowds and sold 100,000 machines in less than 90

days—this despite the fact that the machine did little more than run a crude word processor and a paint program. Still, it seemed different. It was somehow exciting. It had that magic you see in a product once in a blue moon.

Programmers and hackers fell in love with the machine because it had the easy-to-program 68000 chip and represented an antiestablishment ideal.

Years earlier, before IBM, things had been different. Apple was the establishment. It held the edge in the business world with its Apple II running *VisiCalc*. But in 1981 IBM stumbled onto the scene and simply took charge of a marketplace that Apple couldn't maintain. Other pretenders such as DEC, Texas Instruments, and even Hewlett-Packard couldn't figure out what to do right; hence they were left in the dust by IBM then rudely stomped down by Apple, which steadfastly followed in the mammoth IBM wake. When the dust cleared, it was IBM and Apple setting the standards. Anyone else who wanted to make any money had to copy one or the other and hope to scrounge sales from a group of frugal buyers looking for a better deal.

OPEN ARCHITECTURE Here's where IBM got all the attention. Apple had always protected itself with proprietary patents and made cloning next to impossible. The Apple strategy was risky, since it opened the possibility that Apple's proprietary system would not be popular and might simply die on the vine—as did those of dozens of companies before them who followed this tactic.

Everybody waited to see what would happen. Well, they didn't exactly wait. IBM was open game, so the cloners went to work. Moreover, the PC had an open system, and add-in card makers geared up for a bonanza. Soon there began an IBM feeding frenzy that continued through the release of the PC-XT and the AT. Apple II sales were lagging, and Apple knew that for the company to survive, the Mac would have to become a true second standard.

Apple knew the weak spots in the Mac. Critics had pointed them out from day one: no color, no expansion slots. Apple hoped that an IEEE 488 port in the back of the early Mac would do the job. It could be used as a quasi-bus, and peripherals could be daisy-chained off the thing. All it did was run slowly and anger the critics. This old trick didn't work for the early HP micros or the Commodore CBM machines either. Why should it work for the Mac? It didn't.

Apple countered by employing a fast SCSI port as I/O. It was fast, but still not fast enough for the performance maniacs. So, in the wings, the development team was designing the Mac II. Some jokingly called it the Lisa II, and, like the Lisa, we all knew about it for a year before it was finally shown.

CHEERS AND YAWNS When the Mac II was announced in March, the Mac community went wild, and the IBMers yawned. I was amused by two friends, one in each camp, who had seen both the new Mac II and the PS/2 machines a few months before release. Each of them said exactly the same thing. "The new

MAC VS. PC: AN ONGOING BATTLE

In July 1985, a year and a half after Apple released the first Macintosh, *PC Magazine* compared this relative newcomer with the IBM PC (Volume 4 Number 15, "PC vs. Mac: An Unfair Match?"). Technologically speaking; that was a long time ago, when most software for the Mac had not yet reached maturity and when the PC was still using the 16-bit, 8088 processor. Our reviewers, Diane Burns and S. Venit, pitted a 512K-byte PC-XT against a 512K-byte Macintosh in several applications and found that the Mac was indeed a formidable contender in all areas.

To make the machines as similar as possible for testing, both were equipped with a mouse and a graphics card, and the XT system included a color monitor to improve its graphics capabilities.

The reviewers began by comparing *Microsoft Word* on the two computers. In all the time tests the two machines performed similarly, with the Mac slightly ahead. One of the most noteworthy differences between the word processing capabilities of the two machines was that while the Mac could display custom fonts on the screen, the fonts on the PC all appeared alike until they were printed. Still, the reviewers did not consider the differences between the two machines important enough to suggest that a user switch from one to the other.

The other tests produced similar outcomes. The reviewers noted that *Crunch* on the Mac was more powerful and easier to use than 1-2-3 on the PC, although it was faster to use the PC because of its Pg-



Two years after our first IBM vs. Apple cover story, the battle is hotter than ever.

Up/Dn keys and its quicker access time.

Using *Powerbase* on the PC and *Omni 3* on the Macintosh to test database capability, the Mac was judged as the PC's equal with limitations stemming from the software rather than the hardware. The lack of database programs for the Mac made it less desirable to use than the PC, with its large library of database software.

The Macintosh's lack of color capability was brought into focus in the business graphics test, but its high-resolution screen was actually preferred to the PC's fuzzier color resolution. Once again, the reviewers found the Mac easier to use, but they recommended the PC for users

who insisted on color for presentation graphics.

The Mac was already well-known for its outstanding drawing capabilities, so it was no surprise that in drawing tests the biggest differences between the two machines came to light. Aside from the PC's color advantage, the reviewers saw no reason to choose the PC over the Mac and its easy and sophisticated *MacDraw* program.

The Mac's graphics capabilities also came in handy in the telecommunications packages. At the time these tests were run, however, communications software was not well equipped to handle graphics, so this feature was not utilized to its full potential. On other counts in the telecommunications category, the differences between the two machines were barely discernible.

Overall, the friendly Mac held its own against the powerful PC. Questions arose as to whether the simple-to-use software of the Mac was a bonus or actually a disguised curse that would render its users incapable of mastering more complex programs. Rather than pass judgment, the reviewers described their hope for a future in which the two machines could work side by side in the office. Today the open architecture of the Mac II and innovations in connectivity technology are bringing us closer to that vision.

—Rachel Miller

Rachel Miller is a history major at Barnard College in New York City and a PC Magazine intern.

Mac/IBM [choose one] is fantastic. I guarantee you'll want one. I got to see the IBM/Mac [choose the other one] too. Let me tell you—junk!"

But it looks like the Mac II wasn't even necessary. Apple's doggedness and the endearing quality of the little Macintosh kept the dream alive. Apple has managed to produce a second standard, and they did it mostly through goodwill. They decided to be nice guys. Arrogant, but nice.

Without clones to juice up the Mac market and make developers think there was big dough to be made, Apple had to do things differently to put dollar signs in the eyes of developers. So it catered to the third party with glad-handing and encouragement. Special teams were staffed to help the programmer who wanted to put his software on the complex Macintosh operating system. The company loaned machines like there was no tomorrow.

Even more interesting is Apple's ability to get tons of free publicity by means of a technique known as event marketing. Apple's product line consists of just a few dozen products. But every time Apple rolls out something new, it throws a huge party with attendant publicity. A new product from Apple is an event. Nobody in the IBM camp does this with Apple's flair.

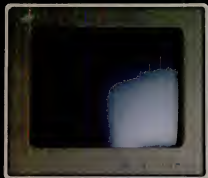
Apple now has a lot more going for it in its battle than it did in the days when the

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■ APPLE VS. IBM

Lisa went up against the PC. Besides friends in the software industry and the media, it has a clear vision for its users and for its developers. They know what to expect from Apple. Apple tells them. Meanwhile, there is confusion and disarray in the IBM camp.

GETTING INSIDE Remember that early in the battle, the closed box and proprietary software of the Lisa, together with its high price, doomed the machine from the beginning. While the Mac II's price isn't going to be popular, its open NuBus architecture, which was developed for the most part at MIT and more or less standardized at Apple, has earned wide praise.

The IBM PS/2 family uses its proprietary Micro Channel Architecture. This bus has everyone confused because of a perceived threat of litigation if anyone clones it. Confusion reigns even in the add-in card business. What to do? Nobody knows. For example, each card requires an embedded ID number so that the system can configure itself. IBM is supposed to assign the numbers to independents, but no stable system seems in place yet.

To make matters worse, Compaq has its own design for a 32-bit bus, Phoenix Software has another, Tandy still another, and so on. It's a laugh riot. The strength of the IBM side in this never-ending battle lies in compatibility and clonability, which combine to create a larger market for software and attract a greater number of talented software designers, thus making the machines more attractive because of extensive software, thus creating more interest, thus . . . you get the idea.

Now it seems that Apple's proprietary tactic has paid off, at least for the moment. There are no clones on the Apple side going every which way to confuse things, so it's a calm, serene world. A disadvantage remains, though: no clones means no independent boosters. It's boosters and clones who will always account for most of the noise made on the IBM side of the spite fence. In contrast, Apple hopes to keep its third-party independents and its users vocal. That's all it has.

Then again, there are the children. Apple pushes its machines into schools relentlessly in the hope that the graduate raised with an Apple in the dorm will maintain

some loyalty when he or she ventures into the cruel world dominated by icy blue IBM machines. IBM hasn't been able to crack Apple's stronghold on this market, though it recently launched a new attack with its August introduction of the 8086-based PS/2 Model 25.

The marketing battle between these two camps will not be over in this decade, and when it ends, it will be the users who decide who wins. If Apple has a shot at the victory, it will be because of (or despite) its

The biggest difference
between the two worlds might
simply be an attitude—an
attitude that is reflected
in the number of users in
each camp who are having fun
with their computers.



advanced operating environment with its mouse and icon interface.

A FRIENDLY ENVIRONMENT The Mac operating system is a marvel little understood by the IBM world. The file structures and the design of the system are so complex that a \$35 book the size of the Manhattan phone directory is needed just to begin to understand what you can or cannot do in a Mac environment. The fortunate thing is that it's the developers who need the book. The user sees nothing but a breezy, easy-to-use program. The result of the additional effort needed to make Mac software work properly benefits the users in ways not understood in the IBM world. Good programs running on a Mac are genuinely intuitive. Rarely is documentation required to operate a software package.

The operating system on a Mac is also smarter than DOS. For example, on a Mac, you can have a document created with *MacWrite* and a document created with *WriteNow*, two popular Mac word processors. You can edit either one with

any number of programs, but the file header (unknown to the user) tells the computer which program originally created the document. If you execute the document, it immediately informs the operating system that it's not a program but a document created by, say, *WriteNow*. The operating system fishes through the entire hierarchical database of directories, folders, and folders within folders to find *WriteNow*, then executes it and loads the document. After all, it figures that this is what you really want. And, in fact, it is.

The IBM world has *Microsoft Windows*, which naive users assume is similar to the Mac interface. It's not. The *Windows Executive* is laughable when compared with the Mac operating system and interface. IBM devotees think that the Mac must be a clunker because of their familiarity with the *Windows Executive*, which they assume is like the Macintosh. Conversely, Mac users who have encountered the *Windows Executive* think that IBM users must be fools to use such a thing. Hence the gap between the two camps widens.

Another difference between the machines lies in their microprocessors: IBM with its Intel 8088 to 80386 chips and Apple with its Motorola 68000 to 68020 chips. Deciding which family of chips is best is difficult, but nobody can deny that Motorola has an edge when it comes to addressing scads of memory effortlessly and letting programs use that memory without a lot of rigmarole. While we hear about the eventual breaking of the ludicrous 640K-byte barrier for contiguous addressable memory on the IBM family of computers, the fact is that except for convoluted schemes such as the Lotus/Intel/Microsoft EMS and other fancy footwork, we're stuck at 640K for at least 6 more months, while many Mac IIs are being shipped with 4 megabytes of main memory today. The smaller Macs have been managing 1 to 4 megabytes of usable memory for more than a year.

The ease with which the Mac accesses gobs of memory is due to the 68000 family of chips, which do not require the complicated manipulation of segmented memory pages that the Intel chip does. This is the big gripe you hear over and over about the Intel chip.

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IBM vs. Apple: Product Developments

Apple Computer beat IBM to the starting line in the personal computer market by 4 years with the introduction of the Apple II in April 1977. It soon became a favorite of hackers and video gamers, and, with the arrival of VisiCalc spreadsheet software, it started showing up in offices as well.

In September 1980, Apple introduced the Apple III, targeted at business users. Its subsequent failure revealed that the business world was not quite ready to let go of its CPM machines—at least until the next summer, that is, when IBM entered a young but increasingly crowded market with its own creation, the IBM PC.

With the announcement of the PC in August 1981 (and the development of word processing, spreadsheet, and database software to go with it), corporations became receptive to the idea of a personal computer on every desk. And while IBM sold out its PC inventories, Apple geared up for its second attempt to reach the business market with the Lisa.

Introduced in January 1982, the Lisa was a revolutionary machine, with pull-down windows and menus, icons, and a mouse. But it was expensive (almost \$10,000), and it lacked the software library and brand name recognition that the less sophisticated IBM PC enjoyed.

While Apple engineers were developing a new machine that would incorporate many of the ill-fated Lisa's advanced features, Apple fortified its presence in the home and education markets with the successful marketing of two new Apple II models: the Apple IIe in January 1983 and the slim IIc a year later.

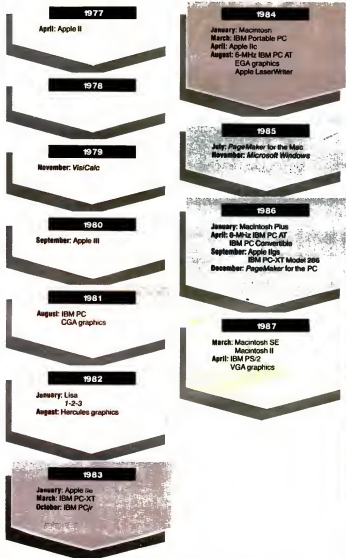
On January 24, 1984, the Macintosh, a direct descendant of the Lisa, was introduced. The Macintosh impressed buyers with its sharp monochrome graphics, simplicity of use, and Lisa-inspired pull-down menus. Three months earlier, IBM had launched a preemptive strike at the Mac with the introduction of its PCjr, but the underpowered machine could not compete with the sleek Mac.

At about the same time, in March 1984, IBM introduced its first portable computer, the Portable PC; almost 2 years later IBM's first laptop, the PC Convertible, hit the shelves. To this day Apple has not attempted to design a portable or laptop that might incorporate some of the features of its desktop models.

In August 1984, IBM's PC AT made its first appearance and quickly set a new standard of computing power, especially in the business arena, where its speedier database searches and spreadsheet calculations were welcomed enthusiastically.

Apple extended its two lines of computers with the MacPlus in January 1986 and the Apple IIGx, with enhanced graphics and sound, in September 1986. In March 1987, a month before IBM announced its PS/2 family, Apple presented the flagships of its new generation: the Macintosh SE and the Macintosh II—Alan Cohen

Alan Cohen is a computer science major at Columbia University in New York City and a PC Magazine intern.



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Putting all the technicalities and marketing schemes aside, the biggest difference between the two worlds might simply be an attitude—an attitude that is reflected in the number of users in each camp who are literally having fun with their computers. That many PC owners do have fun with their machines is attested to by the brisk sales of IBM PC games—although the PC's CGA makes it a poor excuse for a game machine.

Games aren't the whole picture. The Macintosh, for example, has programmable screen backdrops, programmable

It is not unusual to hear an elephant blurt or an *aaa-oogah* horn sound in the office of a Mac user.

noises it makes when it's booted, and a programmable error beep. It's not unusual to hear an elephant blurt or an *aaa-oogah* horn sound in the office of a Mac user when that's his or her choice for a beep sound on the machine. Individuality is a key element of Mac usage. When you sit at a Mac used by someone else, you see the heightened level of customization and pronounced individuality as soon as you boot the machine. Since the Mac is oriented toward graphics images for everything, the view of someone else's desktop is always fascinating. There's no comparison to the pedestrian IBM list of files within carefully constructed subdirectories.

Make no mistake about it. These are two worlds. The personalities are different. The attitudes are different. One side may be a little too cutesy, and the other tending a bit too much toward gray. When Mac users are playful, they may be too silly. When IBM users are playful, they may be too boring. When Mac users are serious, they are arrogant. When IBM users are serious, they are arrogant, too. That seems to be all they have in common.

John C. Dvorak is a contributing editor of PC Magazine.

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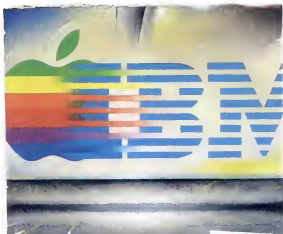
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CIRCLE 291 ON READER SERVICE CARD





THE BEST ^{OF} BOTH WORLDS

It used to be an easy choice:
IBM for work, Mac for home. Things aren't
so simple anymore.



COVER STORY JIM SEYMOUR

The similarities are almost as interesting and remarkable as the differences between them. From their announcement dates exactly one month apart, the Apple Macintosh II and IBM PS/2 Model 80—the new flagships from Apple and IBM—have shared strikingly similar specifications and roles in their makers' lines. Indeed, it sometimes seems they have more in common than at odds.

Both computers introduce new bus structures for their makers—in both cases, sharp breaks with earlier designs. Both

forfeit hardware and software compatibility with earlier models in the interest of much better performance. Both rely on fast ESDI hard disks for much of their speed. Both mark their makers' leaps to new, more powerful microprocessors from the same families as those used in their earlier machines.

Both introduce new graphics systems, at identical 640- by 480-pixel resolution levels on their standard color monitors. Both offer new mice as integral pointing devices, without requiring users to forfeit

expansion slots for the mouse interface. Both are clearly intended for the brave new world of megamemory, where 1 megabyte is just an opening bid and at least 2 to 4 megs are required for serious work. Both stand to benefit dramatically from new operating systems designed with these machines in mind. And both made it to market a year later than expected.

WATCHING THE OTHER GUY Indeed, examining both systems under the hood, and using similar applications on

■ MAC II VS. PS/2 MODEL 80

both machines, it becomes clear that Apple has learned a lot from watching IBM: how Big Blue sees the future of personal computing tied to system-to-system connectivity, and how it prices and positions new top-of-the-line products. And it's equally clear that, as much as it would resist the suggestion, IBM has learned a lot from watching Apple redefine user interfaces, use great gobs of memory for fast context-switching, and build into its machines the fundamentals of connectivity.

Both machines are hot boxes—two to three times faster than their makers' previous mainstays and potentially much faster with coprocessor cards certain to appear for their new (and very different) buses—buses finally receptive to true multiprocessor computing.

Both are hot in another sense, too: they're hard to find, with the few units that make it into dealers' hands generally going to satisfy backlogs of orders placed months

ago. Big Blue began deliveries of the Model 80 a shade sooner than promised, in early summer. But they're still tough to find. Apple shipped the Mac II more or less on schedule, shortly before IBM—but a squabble with Sony, the source of the superb 13-inch Apple RGB monitor designed for the Mac II, has kept Big Fruit's new wonder a rarity because the color displays have been almost impossible to find.

POWER SPECS Now that Apple has a Mac ready to play in the big leagues, and now that IBM has finally rolled out its first 80386 PC, we thought it was time to take a look at the vendors' top-of-the-line systems to see how they compared one-on-one, as well as how they coexist in a mixed-hardware environment.

First, a quick look at both machines.

IBM's PS/2 Model 80 8580-041 lists for \$6,995, plus another \$685 for the pick-of-the-litter Model 8513 12-inch color display,

and \$120 for the PC-DOS 3.3 operating system package. Add \$95 for a lumpy IBM PS/2 mouse. For your \$7,895, you get a 16-MHz Intel 80386-based tower-style PC with IBM's excellent 101-key enhanced keyboard, an ESDI (enhanced small-device interface) 44-megabyte hard disk drive, a 3½-inch 1.44-megabyte microfloppy disk drive, and seven available expansion slots in the new Micro Channel Architecture bus design. You also get 1 megabyte of 80-nanosecond RAM on a motherboard that accepts up to 4 megabytes (using 1-megabit chips, presently available only from IBM), in a system that accepts up to 16 megabytes with add-in upgrade memory cards.

The Video Graphics Array (VGA) display and associated circuitry (finally built into the PS/2 motherboards) allow 16 of 256 colors in its standard 640- by 480-pixel high-resolution mode.

One interesting option: a 16-MHz 80387 math coprocessor chip (not yet available) at \$1,195.

MAC PRICING Apple's new Macintosh II comes to \$6,997 when configured with the superb Apple 13-inch RGB color display, 16-MHz Motorola 68020 main CPU and 68881 math coprocessor chips, Apple's new and mediocre 81-key keyboard,



The Macintosh II looks more like an AT-compatible machine than the familiar one-piece unit from which it has evolved. The full-size (13-inch) color monitor, a feature long desired by Mac users, offers the same kind of Macintosh high resolution that has always awed PC users.



FACT FILE

Apple Macintosh II
Apple Computer Inc.
20525 Mariani Dr.
Cupertino, CA 95014
(408) 996-1010

List Price: \$3,898 (includes one floppy disk drive; 16-MHz 68020 processor and 68881 math coprocessor; 1 Mbyte RAM; 6 expansion slots); with 40-Mbyte hard disk drive and Apple keyboard, \$5,499; 12-inch hi-res monochrome monitor, \$399; 13-inch hi-res RGB monitor, \$999; Macintosh II video board, \$499; Apple extended keyboard (with function keys), \$229; 1-Mbyte memory expansion board, \$349; 2-Mbyte memory expansion board, \$999.

In Short: An innovative and long-awaited flagship for the Apple family. Its friendly interface and speedy mouse operation are key to its attractiveness, and new business software is helping it find a place in the office.

CIRCLE 65 ON READER SERVICE CARD



FACT FILE

IBM PS/2 Model 80

IBM Corp.

Consult your local authorized dealer.

List Price: Model 80 8580-041, \$6,995 (includes 1 Mbyte of RAM; 1.44-Mbyte floppy disk drive; 44-Mbyte hard disk drive; clock/calendar; serial, parallel, mouse, and video ports; 8 expansion slots; 225 watts power; and IBM enhanced keyboard). Model 80 8580-071, \$8,495 (includes 70-Mbyte hard disk drive; 2-Mbytes RAM). For both Model 80s: 12-inch VGA monochrome monitor, \$250; Model 8513 12-inch VGA color monitor, \$685; mouse, \$95; DOS 3.3, \$120. Model 80 8580-311, \$13,995 (includes 20-MHz 80386 processor; 2 Mbytes RAM; 314-Mbyte hard disk drive; second 314-Mbyte hard disk drive, \$6,495. Model 80 8580-311 available first quarter 1988.

In Short: A large and powerful machine in which applications programs perform better than ever before. The promise of OS/2 adds even more to its potential.

CIRCLE 66 ON READER SERVICE CARD

an excellent one-button Apple mouse, one 3½-inch 800K-byte microfloppy disk drive, an ESDI 40-megabyte hard disk drive, six expansion slots of standard NuBus design, and 1 megabyte of RAM on a motherboard that accepts up to 8 megabytes (in a system that can handle up to a giddy 2 gigabytes with add-in cards).

The standard video board supplied with the Mac II provides 640- by 480-pixel resolution with up to 16 colors from a palette of 256. Most buyers will opt for Apple's \$149 kit of video-memory RAM chips, which cranks the color palette up to 256 out of 256,000.

Apple includes in the hardware price the *System* and *MultiFinder* programs, which together constitute the Mac's operating system, as well as the new *HyperCard* "stackware" program (see the sidebar "The New Seekers: Hypertext Comes of Age").

On a spec-versus-spec basis, the two computers appear close. On the Mac II, which has a slightly smaller disk drive, Apple tosses in the math coprocessor, the mouse, and the system software IBM charges for separately; hence the price advantage may go to Apple. But IBMs are



As the flagship of the PS/2 family, the IBM PS/2 Model 80 provides 80386 processing power, and VGA resolution circuitry, which is built into the motherboard, allows the monitor to generate high levels of resolution and 16 of 256 colors on-screen.

more commonly and more deeply discounted than Apples—and in any case, in this league no one chooses one system over the other to save a few hundred dollars.

APPLES AND ORANGES? A direct, rigorously quantified comparison of the performance of computers built around different microprocessors, running different operating systems, is almost impossible. Even when test programs written for one environment, such as the PC Labs benchmark tests for PC compatibles, are recompiled for the other machine, too many differences remain for anyone to draw precise conclusions.

Getting lost in a maze of Whetstones, Dhrystones, and Dhamstones leads to conclusions such as "Both machines deliver 2 to 4 MIPS of computing power."

Aside from the uselessness and ease of manipulation of MIPS figures—millions-of-instructions-per-second measurements, popularly known among computer techies as Meaningless Indices of Performance—that kind of comparison isn't very helpful to someone more interested in producing letters, spreadsheets, mailing labels, and presentation graphics than in charting speed tests.

That's because our perception of the performance of a computer is based on how it handles the applications programs we use to do real work. It's perfectly possible to argue, for example (as some do), that using a disk-caching program to speed up apparent performance is just a cheap trick: the computer isn't really that fast.

Or that using a program such as *Microsoft Word*, which does its own extensive (and invisible) prefetching of first, previ-

Purchase Requisition

QUANTITY	DESCRIPTION
1	MACINTOSH II
1	IBM PC AT

Impossible!
Warren!
Choose one or
the other —
S.

The obvious solution
was unrealistic.

"I would have
given up anything to
use a Macintosh, except
my PC software."

"You can't have your Macintosh™ and PC too!" Famous last words.

People say, "Where there's a will, there's a Warren." Which means I don't settle for words like No. Impossible. Can't be done. No way.

So when I decided I wanted a Macintosh, but didn't want to give up Lotus 1-2-3® or dBASE® III, I naturally set about looking for a way to have it all.

The fastest fix was to buy both an IBM® PC and a Macintosh. "Not possible," said the DP/MIS manager. "Pick one. Any one you want, as long as it's MS-DOS® compatible." Witty guy.

Then I searched everywhere for someone willing to loan me a PC in exchange for executive privileges. I was willing to give up anything, but I kept hearing No. Not interested.

Without another alternative in sight, I decided to surrender and settle for a PC. Then, I discovered an article on AST's newest products—

What I like best about AST's Mac86 and Mac286:

- I retain the benefits of the Mac desktop while running DOS
- I have full access to DOS programs and data through 5.25" MS-DOS floppy drives
- I can cut and paste text from both MS-DOS and Macintosh environments
- My MS-DOS files share Macintosh hard disk volumes

MS-DOS co-processors for the Macintosh II and Macintosh SE. The cavalry had arrived.

The article said AST's Mac86™ and Mac286™ allow you to actually run MS-DOS application programs on your Macintosh. Just plug the DOS

processor into your Macintosh II—Mac86 into an SE—and load your favorite MS-DOS application software onto the Mac's hard disk. I was sold.

MS-DOS on my Mac looked and felt just like all my other Mac applications—great. I just pointed and clicked. The MS-DOS prompt I know and love appeared in a window on my screen. From there on, I used MS-DOS programs and commands as if I were working on a PC.

I even moved Macintosh files into MS-DOS, sometimes cutting and pasting parts from one environment to the other. And when I was finished with my PC and Macintosh files, I stored them both on the same Macintosh hard disk without any clumsy file transfer procedures to slow me down.

Back in the Macintosh environment, I still had immediate access to all of my PC files. Using Macintosh software, I reopened a PC file, enhanced it, then merged it with a Mac file. And when I was finished, I printed it on the LaserWriter®.

I guess the moral of this story is: You CAN have your Macintosh and PC too. Call AST today to find where you can buy Mac86 or Mac286. (714) 553-0340. BBS: (714) 660-9175. FAX: (714) 660-8063.

AST
RESEARCH INC.



CIRCLE 124 ON READER SERVICE CARD

Mac86 and Mac286 meant I didn't have to compromise the Macintosh I wanted for the IBM software I needed.



THE NEW SEEKERS: HYPERTEXT COMES OF AGE

Sometimes very powerful ideas get lost in the background noise of technology until equally powerful tools come along to help us understand those ideas and put them to work. Ted Nelson's "hypertext" idea has been rolling around in the computer industry for almost two decades, without catching on, perhaps because it has yet to attract that critical mass of products that put an idea to work in a form people find useful.

No longer.

In August at the MacWorld Expo in Boston, Apple presented two new products, one of which has the juice to popularize the idea and the use of hypertext far beyond today's limited understanding of the term. Apple calls the product HyperCard, and to see it at work is to understand immediately how very powerful Nelson's idea was.

HyperCard is in effect a database/applications-building tool. But that's about as clumsy as calling a Steinway a music/applications building tool, for HyperCard (known as WildCard during development at Apple) is an elegant product that's useful right out of the box.

HYPertext LINKS The basic idea of hypertext is simple: gather a lot of text, perhaps in a lot of files; then make possible links, or leaps, from any word or item to any or all related words or items anywhere else in that mass of text.

Say you're reading an electronic encyclopedia's entry on Iowa and are in the middle of a passage on corn production. You should be able, hypertexters argue, to put your cursor on one of the occurrences of the word *corn*, hit a key, and

jump to any and all corn-related entries in the whole encyclopedia, from corn bread recipes to cornflakes to "corn-likker" to microwave popcorn to U.S. corn exports in 1985 to . . . maybe even cornball comics and corny jokes.

Great idea. But how do you implement it?

Apple's Bill Atkinson, who applied Nelson's ideal (and who also wrote *MacPaint*), started with the assumption that index cards are a convenient way for many of us to gather information. But the very discreteness of those index-card entries and the disparate nature of the information they hold defy organization and retrieval beyond simple alphabetization of first-line entries and maybe some keyword indexing.

So Atkinson built HyperCard, which allows users to accumulate huge piles of metaphorical index cards, organizing each "stack" of cards around some common theme but enabling many stacks to be linked in ways that allow lightning-fast hypertext-style searches. Each card can hold up to 32K bytes of data (including graphics as well as text); each stack of cards can hold up to 500 megabytes. Searches are blindingly fast: about 1 second to search through a stack of a few thousand cards.

Atkinson says files as large as 20 megabytes ought to be searchable in just 2 seconds or so. And HyperCard also automatically handles data compression at a 30-to-1 ratio. The observant will note that the data capacity of a HyperCard stack is almost exactly the same as that of a CD-ROM disk, which, along with the search-speed improvements produced by

its data compression routines suggests that HyperCard may become a primary indexing and retrieval medium for small optical disks.

NOW: STACKWARE Because not all of us have the time, patience, or good ideas needed to assemble useful stacks of HyperCards, Apple has begun pushing the idea of "stackware" to use with the program. HyperCard is so easy to use that you really don't have to be a programmer to build stacks; indeed, among the first stackware products announced are series from management guru Tom Peters, the staff of the *Whole Earth Catalog*, on-line database vendor Lockheed DIALOG, and author Danny Goodman (whose *Business Class* stackware, from Activision, supplies travelers with a database of information on 60 countries).

There have been rumblings about a similar product for the IBM PC. Apple says it won't do that product and thinks it would take anyone else a long time. But Owl International, publishers of *Guide*, a hypertext program already available for the PC and PS/2, says it will have a HyperCard-compatible version, running on the PC under *Microsoft Windows*, by the end of this year. Owl says its product will be able to read stackware developed for HyperCard on the Mac.

WHERE ARE YOU, OS/2? In August Apple also rolled out its new multitasking operating system, *MultiFinder*. For some time Mac users have been able to do simple context-switching quickly and easily using Andy Hertzfeld's clever program, *Switcher*, to juggle several pro-

grams, next, and last screens of a document—to make jumping to the next or previous screen, or to the top or bottom of a document, appear much faster—is also a cheap trick: the computer just isn't that fast.

So what? For all practical purposes,

perceived speed is the same thing as real speed in using a personal computer. Software that exploits the hardware features of a given system to produce more effective speed is justifiably called fast software. Since when we work with a computer we're working with a system, not just

hardware or software, shouldn't the hardware that makes that apparent speed possible get the same credit?

A ROSE BY ANY OTHER NAME But the comparison problem is even more complex. Applications programs that

grams and datafiles in memory.

But *Switcher* doesn't (yet) work reliably on the Mac II. In any case, it requires a lot of memory to be very practical—memory unavailable, at least from Apple, on the Macintosh until the Mac SE and Mac II appeared. Thus *MultiFinder*, Apple's first stab at a multitasking operating system.

Effective use of *MultiFinder*, like almost all multitasking operating systems, still requires a lot of memory—at least a megabyte, according to Apple, but in practice 2 to 4 megabytes. Since the Mac II's motherboard can hold up to 8 megabytes, the only disadvantage of adding memory is the cost of the chips.

MultiFinder hadn't yet shipped by press time, but demonstrations show it to be a useful advance—and a nice piece of one-upmanship for Apple, which can point out quite fairly that the IBM PC's mainstream multitasking operating system, OS/2, won't be available until sometime in 1988.

The Apple entry isn't a true multitasking operating system, though it's much more than a context switcher. *MultiFinder* can handle just two concurrent programs, and the one in the background gets only tiny slices of the Mac's CPU; the CPU remains dedicated mainly to powering the program running in the foreground. But *MultiFinder* is available, and OS/2 isn't: score one more for the Cupertino crowd.

Both HyperCard and *MultiFinder* are now included without extra charge with new Macintoshes. Owners of existing Macs can buy HyperCard and *MultiFinder* for \$49 each.—**Jim Seymour**

share the same name in versions for both the Mac and the IBM—Aldus's *PageMaker* and Microsoft's *Word* and *Excel*, for example—aren't really the same programs at all. While the user interfaces of *PageMaker* and *Excel* on the two machines are very similar, for example, the

underlying code is very different. Aldus, particularly, has gone a long way toward sharing code between the two versions, but even so, at their core the programs are different beasts.

So, although comparing apparently similar applications on the two machines, as we have done, appears to provide a common ground, the fundamental differences between PC and Mac versions of the "same" program mean that conclusions such as the apparent speed of program execution are only very rough rules of thumb.

Microsoft Windows, for instance, provides a congenial and Mac-like home on the PC for applications such as *PageMaker* and *Excel* that are coming to the PC from the Mac. But *Windows* itself exacts a substantial penalty in performance. Thus, *Excel* on the PC may in fact be as fast as or faster than the Mac version—but we'll never know, because that speed is irretrievably masked behind the busywork of *Windows*.

And remember that speed isn't everything, even in speed-oriented hardware like that of the Mac II and Model 80. The quality of the human interface, both on-screen and through the keyboard and mouse or other pointing device—as well as the intelligence of the metaphors adopted by the operating-system and applications-software designers—count for a lot, too. So we looked beyond pure speed of execution at how both systems worked with well-regarded, high-profile programs to get the job done.

A quick general impression: overall, excluding graphics programs and including operations such as saving files to disk, the PS/2 Model 80 feels and measures about 10 to 15 percent faster than the Mac II. But on graphics packages and on comparable applications using the *Windows* graphics interface, the Mac is slightly to substantially faster—often by 25 to 50 percent.

Second general impression: programs that spring from the Mac environment consistently work, look, and feel better on the Mac. *PageMaker* and *Excel* implementations on the PC are very good, fully featured, and amply fast on a speed demon like the Model 80. But they're still quicker and smoother in operation on the Mac.

Now for some specifics.

PAGE MAKEUP CA. 1987 Though *Ventura Publisher* is giving Aldus a run for its money on the PC, and *Ready, Set, Go!* and *Quark's Express* are hot on the Mac, *PageMaker* still stands astride both markets like the Colossus of Rhodes: the dominant product in both camps and with a well-deserved reputation for mixing power and ease of use, enjoying high name identification among personal computer users and lots of happy customers.

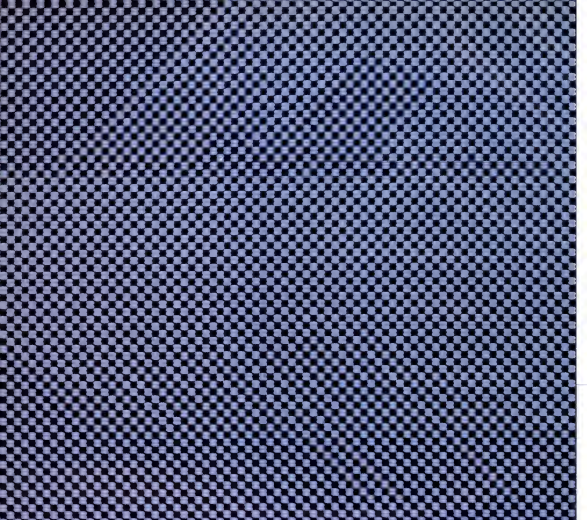
Aldus's versions of
PageMaker for the PC and for
the Mac are by far the best-
matched, most similar
applications available on
both systems.

Aldus's current versions of *PageMaker* for the PC (Version 1.0a) and for the Mac (2.0) are by far the best-matched, most similar applications available on both systems. They also feature a very high degree of exchangeability and interchangeability: *PageMaker* on both machines can read files created by the other version, as well as word processing files from programs such as *Microsoft Word*. We ran *PC PageMaker* under *Microsoft Windows*, Version 1.04, the current release.

Because *PC PageMaker* runs under *Windows*, it supports the fairly wide range of monitors and printers supported by *Windows* itself, or for which *Windows* drivers are separately available—and no others. *Mac PageMaker* by definition supports all the monitors available for the Mac, with video-display issues resolved in the hardware.

WELCOME TO THE MAC Users of *PageMaker* will be immediately comfortable using their favorite page-makeup program on the Mac II. And vice versa: with few exceptions, the same commands do the same things.

Even those used to running *PC Page-*



Now that there's an IRMA put your old ideas about m

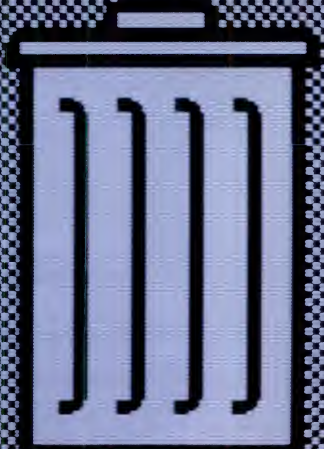
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But no matter what ideas you might have on the subject, they are now old ideas.

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for the Macintosh, you can ainframe links in their place.

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And you can offer the same training and support to each of them regardless of which microcomputer they choose.

What's more, MacIRMA's 3270 emulation software is a true Macintosh application.

It works with a "mouse," pull-down menus, is compatible with Switcher™ and Multifinder™ programs, and supports "copy-and-paste" to incorporate mainframe data into word processing or spreadsheets.

And that's just for starters. For the whole story, call DCA, toll-free, at 1-800-241-IRMA, ext. 518.

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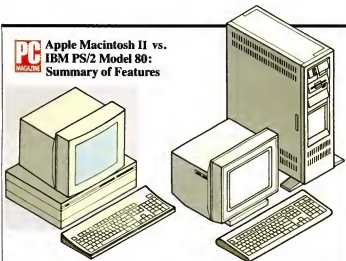
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CIRCLE 537 ON READER SERVICE CARD

■ MAC II VS. PS/2 MODEL 80



Apple Macintosh II vs. IBM PS/2 Model 80: Summary of Features



Apple Macintosh II

\$5,499 with 40-Mbyte
hard disk drive

List price

IBM PS/2 Model 80

\$5,995 with 44-Mbyte
hard disk drive

SPECIFICATIONS

1 megabyte

RAM

1 megabyte

Up to 8 Mbytes

Memory expansion

Up to 16 Mbytes

16 MHz

Clock speed

16 MHz

Motorola 68020

Microprocessor

Intel 80386

Motrolite 68881 standard

Math coprocessor

Intel 80387 optional

Mouse-driven graphics

Primary interface

OS commands

DDS through
add-in board

Secondary
interface

Mouse-driven graphics
through Microsoft Windows
(now) and OS/2
Presentation Manager (1988)

NeBus

Motherboard

Micro Channel Architecture

6

Expansion slots

8

PERIPHERALS

Comes with 81-key Macintosh Plus
style; IBM Enhanced keyboard
option, \$229

Keyboard

Comes with IBM Enhanced keyboard
(191 keys, incl. 12 function keys)

12-inch hi-res monochrome, \$399;
13-inch hi-res RGB, \$999

Monitor options

12-inch VGA monochrome, \$250;
12-inch VGA color, \$685

Included

Mouse

Option, \$95

MISCELLANEOUS

Yes

Clock/calendar

Yes

90 days

Warranty

1 year

Beep, bong, clang,
chime screech

Audio feedback
options

Beep

Maker on a fast Model 80, though, will be surprised at the speed with which the Mac version gets and places graphics and text, and rescales artwork as it builds pages. On the Model 80 the process is fast—and dramatically faster than on an 8-MHz PC AT, the least powerful machine on which I think *PageMaker* makes sense—but on the Mac II, graphics and text almost snap into place when you click the mouse button to insert them.

That crispness is characteristic of almost every operation in *PageMaker* on the Mac II. That *ought* to be the case, of course: an intensely graphical program such as *PageMaker* should perform better on a graphically oriented and graphically optimized system like the Mac II.

Because the Mac and the LaserWriter Plus are themselves tightly integrated systems, Mac *PageMaker* handles printing more easily than does PC *PageMaker*. Though the PC can drive the LaserWriter, many more PCs are connected to Hewlett-Packard LaserJets. LaserJet users must make certain that their printers have enough memory (at least 1.5 megabytes; preferably 2.5—possible only on the new LaserJet Series IIs), and must first convert the BitStream (and other) bit-mapped font files for use by *PageMaker*.

The almost infinitely scalable internal ROM-based fonts of the LaserWriter give a great deal more flexibility, and often better-looking output, than the more limited typeface selection and type sizes (up to only 30 points, or about ¾ inches high) available on the LaserJets.

The results? Overall, *PageMaker* on the Mac bests its counterpart on the PC by a fairly wide margin.

STATE-OF-THE-ART WP When Microsoft introduced the new 3.0 Version of *Word* for the Macintosh early this year, it got a lot of attention. That was partly because the revision was so late—Mac *Word* users had been limping along on Version 1.05 for 2 years—but also because *Word* 3.0 looked like what Mac power users had wanted for a long time: a state-of-the-art word processing program that put PC word processing in its (musty) place.

Previewing Mac *Word* 3.0 last fall, I saw the future of word processing on personal computers: a plethora of features,

■ MAC II VS. PS/2 MODEL 80



The 81-key Macintosh Plus-style keyboard that comes standard with the Macintosh II has no function keys but does have a unique power on/off button located at the top center.



The 101-key IBM Enhanced keyboard is standard with the PS/2 Model 80. Its solid feel and audible and tactile feedback remain unmatched by any other keyboard. It has 12 function keys.

menus of user-selectable length and thus complexity, true WYSIWYG displays including accurate representations of type sizes and fonts, and the powerful text-formatting features long associated with *Word* now made easier to understand, easier to get at, easier to use.

Word 3.0 turned out to be all that and more. And unfortunately, also less. Version 3.0 was as buggy as a Moscow embassy. The phone lines at Microsoft lit up with complaints; the Mac bulletin boards and conferences of on-line services blazed with vivid, often unprintably harsh criticisms; and Mac *Word* users generally lit up, furious that a program so long awaited, and so full of promise, could be so flawed.

Mac users as a class are a knowledgeable and demanding lot who suffer neither fools nor flawed programs very well. Microsoft eventually acknowledged the problem and over the summer sent out "maintenance release" Version 3.01, to fix those bugs.

GETTING BETTER, NOT OLDER Meanwhile, Microsoft continued to improve *PC Word*, moving to Version 3.1, then 3.11, then the new 4.0, shipped in September.

Word 4.0 on the PC may be the most dramatically improved version ever released of an already well-established program. Much faster in almost every way than its predecessors, *Word* on the PC has

forever shed its reputation as the tortoise of word processing software.

We compared *PC Word* 4.0 on the Model 80 with Mac *Word* 3.01 on the Mac II. Both *Word* 4.0 and the Model 80 came out way ahead.

Though the Mac *Word* interface is appealing and the new, larger display of the Mac II shows WYSIWYG at its current best, the program is sometimes sluggish.

**What made the Mac
credible wasn't the advent of
desktop publishing.
It was the advent of Microsoft's
Excel.**

Using the "elevator box" that is an integral part of the ROM-based Macintosh interface is a clever but often slow and clumsy way to make major jumps in a document—say, to the last screen, or to a designated page. Keystroking that jumps on the Model 80 with *Word* 4.0 is faster and more convenient. Microsoft has done an excellent (if unMac-like) job of offering keyboard moves with Mac *Word*, rather than forcing users to move to the Mac's

mouse, but things still happen faster on the Model 80.

The Mac II's mediocre keyboard was a major factor in calling this one for the Model 80. The Mac keyboard is flat, compact, and attractive. It also has an awful touch, with too-short key travel; and for those who fall short of touch-typing status and need to peek at the keyboard, it features remarkably unattractive and hard-to-read characters on its key caps.

By contrast, the newish IBM 101-key enhanced keyboard, introduced on the RT PC a year and a half ago and now standard across IBM's PC and PS/2 lines, is big but has a magnificent touch, legible key caps, and—unlike the standard Mac II keyboard—function keys.

Function keys are the subject of much derision among the Macintosh faithful, but as the Mac moves into the office, more and more software for the machine will allow use of function keys as mouse-click alternatives—for those whose keyboards have them. In fairness, Apple does offer an enhanced keyboard (not yet available for review) similar in form and key layout to IBM's enhanced keyboard.

EXCELLENCE One of the enduring myths of the Macintosh holds that what made business take the Mac seriously was the advent of desktop publishing. That's nonsense. What made the Mac credible was the advent of Microsoft's *Excel*.

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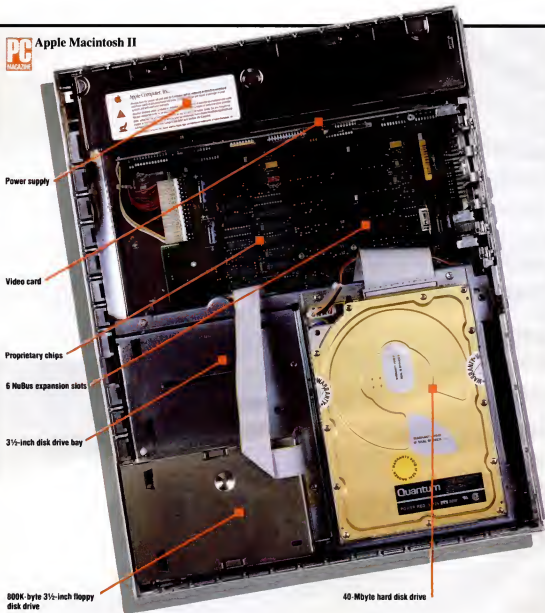
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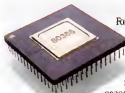
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Suggested List Price	\$3995	\$4495
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CIRCLE 177 ON READER SERVICE CARD

MAC SOFTWARE GETS SERIOUS

Loyal, dyed-in-the-Blue-wool IBM LPC users often dismiss the Macintosh as a yuppie plaything, a nice if expensive gadget for drawing grainy pictures and writing letters with rows of little bunnies printed across the bottom of the pages.

Though for some that attitude grew out of disappointing personal experience with the early, feeble, single-disk-drive 128K Mac, much of the disdain for the Mac among PC users arises from the perception that there isn't much good software available for the machine—certainly nothing like the diversity and quality of applications running under DOS.

Time to look again, friends.

While the PC leads the Macintosh in number of programs available by maybe ten to one—with about 2,500 programs for the Mac, as opposed to a reported 25,000 for the PC—in quality, the Mac software kit challenges almost anything on the PC.

To be sure, the Mac doesn't offer the hundred or more word processing programs available for the PC. But who's going to use a hundred word processors? What counts is that the very few from which you're likely to choose your pro-

gram are good. On that basis, the Mac does very well indeed, with *Microsoft Word*, *MindWrite*, and *WriteNow* available, *WordPerfect* and *FullWrite* coming soon . . . and, yes, *MacWrite* for the occasional memo.

WATCH OUT, 1-2-3 In spreadsheets, the Mac has *Excel*, arguably the best spreadsheet ever written—and so good that it's coming to the PC this fall, under *Microsoft Windows*, as *PCExcel* (to be reviewed in an upcoming issue). There's also *MacCalc* and *Multiphan*, and an odd but useful program called *Trapeze*, which can hide its spreadsheet calculations behind attractive, unsheet-like report-style printed pages.

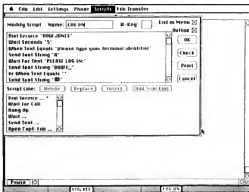
In databases, the Mac spawned *Helix* (and now *DoubleHelix*) and *Omnis 3*—both powerful, versatile relational databases easier to work with than PC programs of similar power. Both are good applications development environments; *Omnis 3*, particularly, makes development of sophisticated, complex systems relatively fast and easy. And PC users who are fond of *dBASE III* can now buy *dBASE Mac*, which has an excellent, very Mac-like interface and features not

found in the PC *dBASE* products.

In communications software, Mac users have their own, superior version of Hayes *Smartcom*, which allows "live," real-time interactive editing of graphics images at opposite ends of a modem-linked telephone line. And the Mac has *MicroPhone*, Version 2.0, arguably the best personal computer comm program ever written.

Graphics software is in its element on the Mac, of course, and it ought to be good. It is. *FullPaint* and *SuperPaint* extend the original "paint" (bit-mapped graphics) idea, but more interesting are the object-oriented ("draw") programs for the machine, such as *MacDraw*, *MacDraft*, *MiniCAD*, *MGMStation*, and others.

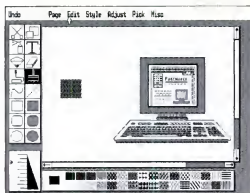
Among the most impressive graphics programs on the Mac are *Cricket Draw* and *Cricket Graph*—both of which are among the very few programs released so far that support color on the Mac II. *Cricket Graph*, particularly, is an excellent business graphics program, with a wide variety of graph types, nearly intuitive operation, and built-in support for color plotters—a rarity in software written for the Mac.



One of *MicroPhone*'s cleverest features is its intuitive approach to building and modifying scripts. Script commands are chosen from the list in the bottom box.

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Excel can support multiple worksheets open at once. It also features easy worksheet linking, intelligent recalc abilities, and superb built-in graphics.



It may look like MacPaint, but it's actually Publisher's Paintbrush running on the PS/2 Model 80. Its functionality is almost identical to that of MacPaint, and it will run in color.

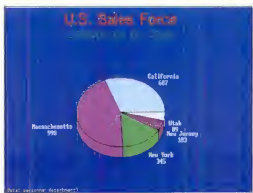
PRODUCTION-ART TOOLS Most impressive of all in the Mac graphics world is Adobe's *Illustrator*, a tough-to-learn but rich and rewarding drawing program. Adobe Systems, developer of PostScript, the page-description language that has come to dominate the laser printer and PC typesetting field, shows off the sophistication of the PostScript

language in *Illustrator* by providing artists with the first personal computer drawing toolkit that meets the demands of the commercial and technical artist/illustrator.

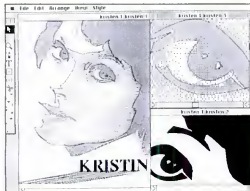
Illustrator's ability, for example, to accept a scanned image, allow the user to trace over that image, rework in the tracing layer a very different piece of repro-

duction art, then finally discard the original scanned image in favor of the newly created illustration is exactly the kind of *production* art tool in demand among graphic artists. We can't get that kind of power on IBM PCs yet.

The output of these graphics programs is enhanced, of course, through PostScript output to Apple's LaserWriter



Harvard Graphics, from Software Publishing, is one of the best business graphics programs for the PC. Its pop-up menus are mouse friendly for speedy chart design.



Adobe's Illustrator is a complicated program that takes time to learn, but the freedom it gives artists to modify scanned images and the kit of tools it provides are immense.



Besides its sophisticated graphics manipulation features, Cricket Draw is one of the very few programs that support color on the Macintosh II.

"I FLIPPED TH OF PAGES TRYING TO



Choosing the wrong database management software can be like doing time.

Ask Harry Viens, the executive vice-president of an advertising agency.

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But with dBASE, all he ended up with was wishing he'd used R:BASE® System V, the database software you don't have to be a programmer to use.

"AFTER USING dBASE I HAD TO BE DEPROGRAMMED."

Viens knew his mini-computer was fine for bookkeeping, but wasn't capable of turning around management reports—critical for

making quick decisions.

"We've got to make decisions in real time, not wait a couple of months to find out what's happening today," Viens said.

"I tried to build this dBASE application nights, weekends and during holes in my schedule. But almost a year later, the miserable thing still wasn't done," Viens told us.

"The language is unnatural. I guess some people love writing code. For me, that's like trying to mow the lawn with nail clippers."

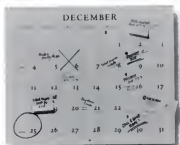
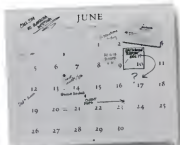
"I SAW, AND I BELIEVED"

Being an advertising person, Viens actually reads ads. He saw our claim that you don't have to be a programmer to use R:BASE, and bought it.

Because of our EXPRESS System, he was

ROUGH A LOT FIGURE OUT dBASE™

— Harry Viens, R:BASE System V user.



able to build the kind of application you'd expect in a custom program from a professional programmer. All without having to write one line of code.

"It took me just three days to do it working part-time," Harry said. So now he can track his forecasts and break them out by the account person who made them.

"R:BASE System V is an amazing product. Despite its power you never seem to get trapped in a corner you can't get out of."

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**R:BASE
SYSTEM V
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InfoWorld's Overall MS-DOS Software Product of the Year.

The 5.25 inch format runs on IBM PC, XT, AT and 100% compatibles, and on all major LANs, with no additional cost for extra users attached to the server. The 3.5-inch format runs on IBM PS/2 and other 80286/80386 compatibles. Trademarks/Owners: Microsoft, R:BASE/Microrim, Inc.; IBM, PS/2/International Business Machines, Inc.; dBASE/Adrian File Corporation; InfoWorld/CW Communications, Inc. © 1987 Microrim.

CIRCLE 366 ON READER SERVICE CARD

"Mac Software Gets Serious" continued

Plus, still the class act among desktop laser printers.

Away from mainstream horizontal applications, Mac software offerings thin out considerably, though there are some striking products out there. It's a lot harder to write for the Mac than for the PC, and the plethora of narrow-application, tiny-market programs for the PC is simply unlikely ever to appear on the Mac.

But the good, unusual Mac programs stand out. Great Plains' Macintosh version of the old *OneWrite* pegboard accounting system is not only the best implementation of that idea yet seen on a computer but probably the easiest-to-use "real" accounting software available.

For desktop presentations, Living Videotext's *MORE*, Version 2.0, and Forthought's *PowerPoint* (recently acquired by Microsoft) are superb tools. And then there's *MacSpin*, almost everyone's favorite tool for 3-D data analysis.

One thing becomes clear after wading through a few dozen, or a few hundred, Mac programs: the most successful ones, in terms of sales as well as usefulness and elegance, are those that most fully exploit the unique features of the Mac—especially the point/click/drag/pull-down menus interface. Shortly after the Mac appeared, for example, Software Publishing ported over to it copies of its *PFS:File* and *PFS:Report* packages—best-sellers in the Apple II and IBM PC market at the time. Both were quick-and-dirty translations of the IBM versions. Neither looked nor felt much like a Macintosh program; neither worked much like a Macintosh program. Both soon disappeared, rejected by Mac users who expected more than a fast port from the DOS world.

LUKEWARM JAZZ Another notable failure in the Mac software market was Lotus's *Jazz*, a klutzy multifunction program that fell well short of Lotus's reputation for fast, innovative, highly functional software. Bizarre, high-tech black-rubber packaging and expensive, high-energy print and TV ads proclaimed "Jazz boogies!" The marketplace saw

less boogie than boogie; *Jazz* moved off the shelves at a distinctly *andante* pace.

MAC-TO-PC MIGRATIONS Though few programs have moved successfully from the DOS world to the Mac environment, it looks as if migration the other way will be a bigger success. Aldus built *PageMaker* into a smash success on the Mac, of course, then very carefully ported it to the PC, running under *Microsoft Windows*. Today, *PageMaker* comes closer than any other program to running identical versions in both environments. Microsoft itself rewrote *Excel* from the Mac to the PC, again under *Windows*. And now Blyth Software, developer of the superb Mac database *Omnis 3*, is bringing a version of it to the PC as *Quartz*—once again, running under *Windows*.

The result in each case has been a good-to-superb PC product. *Microsoft Windows* is the natural home for programs moving from the Mac to the PC, for it approximates (though hardly matches) the Mac's graphically oriented pull-down menu/dialog box environment. (Microsoft has acknowledged that debt to Apple by paying an undisclosed sum for the similarity of the *Windows* interface to the look and feel of the Mac interface.) Unfortunately, the code-shuffling overhead of *Windows* still exacts a penalty in performance for applications running under it. *Windows* and its applications make little sense on machines that are slower than 8-MHz PC ATs and don't really come into their own until they're loaded onto powerful 16-MHz 80386-based PCs—such as the PS/2 Model 80.

The market success of the PC version of *PageMaker*, and the attention that will inevitably be paid to both *Excel* and *Quartz*, bode well for further translations from the Mac environment to the PC environment. Before long we may see in concurrent release for both machines many or most of the programs that are presently popular on each system.

—Jim Seymour

There were already a lot of Macs—guerrilla computers, in a sense—to be found in corporate America before Aldus cooked up *PageMaker* and invented both an application and a market. The users of those business Macs, certain they'd seen a better idea at work, had gone out on a limb to buy them, and often had taken a lot of hard-edged joshing from their PC- and 1-2-3-using colleagues: "When are you going to get rid of that little thing and get a real computer?" "How can you stand that little rattly keyboard?" "Too bad there's nothing like 1-2-3 on that little thing . . . it's so cute!"

Then came *Excel*. Mac owners were finally vindicated because they could drag in their PC-using colleagues, show them *Excel*'s tricks, and watch their jaws drop. *Excel* was simply a better product than 1-2-3, and that was most evident to experienced 1-2-3 users.

Just as *Excel* won Mac users' hearts by validating their choice of the machine, it fascinated PC users (not to mention Lotus): who wondered when, not if, it would come to the PC?

Microsoft ultimately answered with PC *Excel*, due out this fall—running, of course, under *Windows*. We compared a late beta version of *Excel*, running under a beta run-time version of *Windows* 2.0 (the combination Microsoft says it's about to ship) on the Model 80, with *Excel* Version 1.04 on the Mac II.

Remember that even very late beta-version software is often different from release versions, and that one of the last steps in preparing programs for market (in this case, both PC *Excel* and *Windows* 2.0) is to tweak them for increased speed. And remember also that the performance of *Windows*-based software on the Model 80 is likely to be much better under *Windows* 386, allegedly coming soon from Microsoft.

EXCEL MEETS BIG BLUE PC *Excel* isn't a subset of Mac *Excel*; it's a *superset*. With features such as arrays (groups of cells manipulable as one, with memory-usage advantages growing from the storage of only single copies of shared formulas), variable line spacing (allowing typeset-like laser-printed output), and the ability to use the data-pipelining features



Quick-turn the page.

■ MAC II VS. PS/2 MODEL 80

of *Windows'* Dynamic Data Exchange to share data in real time with other *Windows* applications, PC *Excel* is a spectacular product.

And *Excel* on the PC supports color, especially useful in its superb charting capabilities, while Mac *Excel* won't offer color on the Mac II until next spring.

Mac II or Model 80? It's a toss-up. To my taste, despite all of PC *Excel's* additional features, *Excel* still looks and works

Excel on the PC supports color, especially useful in its superb charting capabilities, while Mac *Excel* won't offer color on the Mac II until next spring.

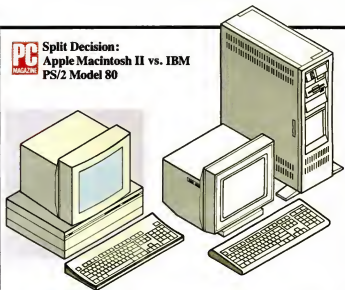
better and faster on the Macintosh II than on the Model 80. But it's much too close to call with conviction.

Recalculating a 2,500-cell worksheet was about 20 percent faster on the Mac II. Saving and retrieving files was faster, too. On the standard Mac color display, *Excel's* characters are larger and much easier to read than on the Model 8513 12-inch VGA color display of the Model 80—and on the large monitors available for the Mac, users get a much larger patch of spreadsheet on-screen, too.

Larger monitors with more than 80-column by 25-line displays aren't yet available for the PS/2 line; current oversize multiscanning monitors for the PS/2, such as the 19-inch analog units from Microvitec, Conrac, and NEC solve the small-type problem but don't yet have the capability to show larger areas of the worksheet matrix. (Oversize monitors for standard PCs and ATs, such as Monitorm's Viking I and Sigma Designs' LaserView, with their own video boards and special *Windows* drivers, do show more of the *Excel* worksheet.)



Split Decision: Apple Macintosh II vs. IBM PS/2 Model 80



Apple Macintosh II

Category

IBM PS/2 Model 80

SPEED

Character applications
Graphics applications

★

SOFTWARE

PageMaker

Microsoft Word

Excel

TSR programs

Business graphics programs

Terminal emulation software

Software library size

★

TIE

★

★

★

★

HARDWARE

Keyboard

Mouse

Networking capability

Innovation

★

The Mac II and Model 80 are evenly matched, which doesn't make the choice any easier. What may help is that their strengths lie in different areas. If you rely on graphics-intensive applications like desktop publishing, the Mac is the clear choice.

But if you're more interested in an established library of business software and character-oriented applications like spreadsheets and word processing, the PS/2 could be the better pick.



That's how much effort it now takes to turn current data into graphs with Graphwriter II.

Actually, it may take even less effort than that.

You see, Graphwriter II® is the only graphics software that lets you automatically generate large quantities of quality graphs based on spreadsheet and database information. All with a single command.

Do you regularly need to graph daily inventory, monthly P&L or quarterly head count? With Graphwriter II, you just set the parameters once—specify where the data and text are located, select the graph type and the style options, and create a list of the graphs you want to produce. Then, with a single command, you can create graphs which reflect your most current data and text.

Graphwriter II is a full-fledged production system.

And Graphwriter II offers you 24 different graph types—more than any other PC graphics package. It gives you control over hundreds of style settings such as type font, heading location, bar width, and color. Or you can use the default settings if you prefer.

With Graphwriter II you can print multiple charts on a page. And you can make color and fill pattern dependent on spreadsheet values. For example, Graphwriter II

can automatically produce a black bar if profits increase and a red bar if profits decrease. What's more, you can use a Graphwriter template to standardize reporting within a department or across your company.

Graphwriter II works with 1-2-3®, Symphony®, or dBase®. And you can export your Graphwriter II graphs to Freelance® Plus to enhance them with, for instance, symbols and diagrams or to Lotus® Manuscript® to combine them with text.

So if you need to create and frequently update graphs from ever-changing data, you need Graphwriter II.

To get a free Graphwriter II demonstration kit, call 1-800-345-1043 and ask for demo kit QA-2524.*

Then you can turn *this* page, too.

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Lotus Graphwriter II

ACROSS THE GREAT DIVIDE: DATA TRANSFER WITH DAYNAFILE

One of the tools most likely to help the Macintosh II become a powerful second standard in Corporate America doesn't come from Apple.

Dayna Communications, of Salt Lake City, has been trying to build bridges between the IBM PC and Macintosh worlds for a long time. Its first effort brought forth MacCharlie, an odd, clunky device that sort of turned early Macs into PCs. In theory, users could effortlessly run PC software on their neither-fish-nor-fowl MacCharlies.

Yes, the DOS prompt came up. Yes, 1-2-3 would load. End of good news. MacCharlie was slow, cranky, and doomed ultimately by economics: if you had a Mac and also wanted a PC, you could buy a decent PC-XT clone for less than the price of MacCharlie and have two separate and uncompromised computers.

MacCharlie fell by the wayside, a curious footnote to Macintosh history. But it did have a use, as some discovered: moving files from the PC universe to the Mac environment.

Dayna paid attention, and when word of what would become the Mac SE and Mac II came along, it got to work on a much more sensible answer: an add-on disk drive for Macs that reads from and writes to IBM PC disks. But the DaynaFile goes well beyond that.

THE IBM STANDARDS The Dayna people acknowledged that there are three floppy disk standards in the PC world, with a fourth coming on fast. The 5¼-inch 360 K-byte disk rules the roost; 5¼-inch 1.2-megabyte disks look like good candidates for the dustbin of history but remain important, if only temporarily;



PC FACT FILE

DaynaFile
Dayna Communications
50 S. Main St.
Salt Lake City, UT 84144
(801) 531-0600

List Price: \$695 (single drive), \$849 (double drive); cables \$45.

Requires: Macintosh 512E (with SCSI upgrade), Plus, SE, or II.

In Short: A superbly implemented Mac peripheral that allows reading from and writing to all IBM PC floppy disk formats.

CIRCLE 676 ON READER SERVICE CARD

and the 3½-inch 720K-byte micro-floppy, IBM style, is the hot act. Number four? The 3½-inch 1.44-megabyte microfloppy—introduced by IBM with the PS/2 Models 50, 60, and 80—may well be the floppy disk format of the future.

So Dayna didn't limit the DaynaFile to just the predictable 5¼-inch 360 K-byte disks. Instead, it's a "two holer," and buyers can specify their choice of any two drives from that first group, with 3½-inch 1.44-megabyte drives coming soon. You can, of course, buy the DaynaFile with any one of those drives

installed, and add another later.

The DaynaFile plugs into the Macintosh's SCSI (Small Computer Systems Interface) port, and like all other Mac SCSI devices, can be daisy-chained, with up to seven devices strung out from one Mac SCSI port. Installation's a snap and will make old PC hands wonder why it's necessary to go under the hood of the computer in the PC world to install yet another interface card for new add-ons.

The DaynaFile has quickly become my second-favorite Mac peripheral (after the LaserWriter Plus) and is the one Mac tool I won't work without. In my office there are two Macs and seven PCs, PC compatibles, and PS/2s; before DaynaFile it was chaos. All those problems are gone now: the DaynaFile puts the Mac in business instantly in a PC-dominated environment.

PC-originated files come up on the Macintosh screen looking just like they were hatched on the Mac. Users can open them under appropriate Mac applications and go to work. Files saved to floppy disks in the DaynaFile later appear as perfectly normal DOS files when those disks are inserted in PC disk drives.

Programs with common file structures—or at least those that already know about file formats in the other machine's world—can read and work with transferred files immediately. *Excel* and *Jazz* on the Mac, for example, can read and write 1-2-3 and *Symphony* files without separate conversion. *Microsoft Word*, Version 3.0, on the Mac automatically translates PC Word files and has a built-in Document Content Architecture conversion routine for programs such as *WordPerfect* and *DisplayWrite*, which can save files in IBM's DCA file format.

Though both Mac and PC versions of *Excel* make good use of keyboard alternatives to mouse clicks, mousing around with *Excel* on both machines showed the superiority of Apple's mouse.

Two-button mice such as IBM's make more sense and seem likely eventually to overcome the lame one-button design favored by Apple. But for now the ergonomics of the Apple rodent are vastly better

than those of the IBM's design. And the variable mouse-movement velocity controls and mouse-click timing adjustments offered by the Mac II's system software point toward improvements needed in

PC *PageMaker* and Mac *PageMaker* can read each other's files directly. And *dBASE* Mac can read *dBase II* and *dBASE III* files from the PC world.

For programs with incompatible file structures and no built-in conversion routines, Dayna supplies conversion software with the DaynaFile, which can handle some (but not many) exchanges: *WordStar* and *MultiMate* on the PC to and from *MacWrite* and *MacWord*, Version 1.05, and *Mac Multiplan* to and from *PC Multiplan* and 1-2-3.

WHEN CHEAPER'S NOT BETTER

There are simpler and cheaper ways to move data back and forth between the PC and Mac environments. Apple, for example, makes an add-on disk drive for the Mac SE and Mac II, which reads and writes 5¼-inch IBM-format disks. And you don't even need a disk drive if all you want to do is occasionally pump data back and forth: you can use a null-modem cable connected to the serial ports of the Mac and a handy IBM PC, with communications software—including special communications programs, such as *PC-to-Mac-and-Back*, made just for that purpose.

But none of those simpler answers make sense in a business setting, where you may need to go back and forth frequently, and where, for the Mac II user, dealing with IBM-format disks is a matter of daily routine. In other words, the typical corporate use of a Mac II, at least for the foreseeable future.

In that kind of mixed-hardware computing environment, you need a highly optimized, industrial-strength tool. Which is a good description of the DaynaFile. —Jim Seymour

Windows' facilities for customizing the underlying hardware to users' tastes.

Generally the Mac's response to mouse clicks is faster and more satisfying than mouse responses in *Windows*-based prod-

ucts on the PS/2 Model 80. Again, speed isn't everything in using a PC, but quick response to commands is always welcome; interposing *Windows* between the application and the system software takes the edge off the PS/2 Model 80's zippy performance.

MAC GENETICS The Mac II carries some innate advantages onto the field in a showdown with the Model 80.

One is the Motorola 68020 microprocessor, roughly equivalent to the Intel 80386 in computing power and speed but coming from a chip family always able to address memory as one giant, contiguous block (see the sidebar "Stacking up the Chips").

Programmers' efforts to deal with the segmented-memory limitations of the Intel 8088/80286 chip family and the 640 K RAM limit of PC-DOS have left us a body of software hobbled by memory size and memory-addressing compromises. Mac II programs avoid that syndrome—though very early Mac programs, that were designed to cope with the idiotic 128K bytes of RAM of the original Mac, show the symptoms of that same kind of imprisonment.

A second substantial advantage is the way the Mac handles pop-up programs, sometimes called TSRs (or "terminate-and-stay-resident" utilities) in the IBM world. The Mac allows access to what are called Desk Accessory programs directly from the menu bar across the top of the screen—at any time, from within any application, since these DAs are reached directly through the operating system. Mac users never worry about how to load three or four pop-ups last, as demanded by many PC pop-up programs.

Even better, users can selectively install up to 15 of these DAs on the Mac II—still without worries about conflicts in memory. Calling most DAs through mouse clicks also avoids the Alt plus something-or-the-other games and worrying about Alt-combination conflicts and shortages. A wonderful new Macintosh program called *Suitcase* allows users to install thousands of DAs on a single Mac—a good example of the Mac world's endearing tendency to go from the sublime to the ridiculous.

TALK TO ME A third natural advantage of the Mac is easier networking (see "No More Missing Links: Apple/IBM Networking"). Every Macintosh has inside it the circuitry needed to connect it to the AppleTalk network. Add a \$50 cable-and-connector package, and you can link your Mac to mine.

At \$50 per machine, we can keep going until we've built a very nice little work-group network in about 15 minutes. Everyone on the net can use one or more LaserWriter printers connected to it, and we needn't dedicate a Mac as file-server. AppleTalk isn't very fast, but it's more

**Mousing around
with Excel on both of the
machines showed
the superiority of Apple's
mouse.**



than adequate for many uses.

Need somewhat faster networking and want to hook some IBM PCs into the net? Check out Centram's TOPS network. Sun Microsystems recently bought Centram; look for even better mixed-hardware networking through combinations of TOPS and Sun's own NeWS network.

Want still more performance on a Mac-only net or a Macs-PCs net? 3Com, the Ethernet people, can build you a very high-performance, highly expandable mixed-hardware net.

BLUE POWER But the IBM PC, especially at the power end of the spectrum staked out by the PS/2 Model 80, also has some very substantial advantages. The overwhelming lead in applications software is one. While many superb programs are available for the Macintosh (see the sidebar "Mac Software Gets Serious"), vastly more are available for the PC.

Among those PC-only programs are many good if obscure vertical-market programs and specialized packages; worrying if you can find the right software for your

STACKING UP THE CHIPS

Both the Intel 80386 and Motorola 68020 are state-of-the-art 32-bit microprocessors with long family traditions. The Intel 80386 retains part of its family resemblance with a virtual 86 mode that provides a virtual machine environment for the 16-bit 8086, along with a real mode that emulates the 80286. The 68020 is part of the 68000 clan, a group that unlike the Intel family, consists only of 32-bit microprocessors.

The main differences between the 68000 and the 68020 chips are related to special instructions and memory bus width: the 68008 has an 8-bit data bus, the 68000/68010 a 16-bit data bus, and the 68020 a 32-bit data bus.

The register view of each member of the 68000 family is the same. It consists of eight general 32-bit data registers and seven address registers. The data registers can manipulate 8-, 16-, and 32-bit values.

The 80386 chip is less regular in its design, but it includes a number of fea-

tures not found in the 68020. The 80386 registers are few in number and are often dedicated to many instructions.

The other main difference between the 80386 and the 68000 family is the way the 80386 addresses memory. The Intel 80x86 family addresses memory via segments and segment registers. The segments used are implicit in an instruction, but they can be altered.

PHYSICAL LIMITS The maximum segment size for the 8086 is 64K bytes, while the 80386 extends the limit to either 1 megabyte or 4 gigabytes, which matches the 68020's maximum segment size. The two chips have the same physical memory limit, and the difference comes into play through the use of "virtual memory," which allows an operating system to provide a virtual view of more memory than physically exists. This trick is accomplished by swapping data from memory to disk and back as needed.

Segment descriptors are automatically loaded from either the Local Descriptor Table (LDT) or the Global Descriptor Table (GDT) when a program loads a value into a segment register. A program normally has an individual LDT, and the operating system supplies common memory and functions to all programs via the GDT.

The 80386 supports code and data segment descriptors, as well as a number of other specialized descriptors. The Task Register (TR) specifies the capabilities for the current task. The 68020 does not have this type of support.

THE PROS AND CONS The merits of segments and large contiguous memory spaces have been debated at length by computer scientists. The 80386 supports both segments and a large address space, while the 68020 supports only a large address space. Clearly, one important advantage of segments is their ability to have their size and location changed in-



Microprocessors Past and Present: Summary of Features

(Listed by increasing size of addressable RAM)

These Intel and Motorola microprocessors have been listed by increasing size of addressable RAM rather than by date of release so that similar chips from the two families are adjacent. Note that throughout its history, the Motorola 68000 family has consistently offered chips with 32-bit internal buses. Intel's chips have evolved to that level, but it has taken time. Note also that the chips that drive the Macintosh II and the PS/2 Model 80 — the Motorola 68020 and the Intel 80386 — both address up to 4 gigabytes of memory and offer virtual memory capability.

	Year of Introduction	Data bus bits	Internal bus bits	Max. speed (MHz)	No. of registers	Addressable RAM	Virtual memory
Intel 8080	1974	8	8	3	7	64K bytes	○
Motorola 6800	1974	8	8	4	4	64K bytes	○
Intel 8085	1978	8	8	6	7	64K bytes	○
Intel 8088	1981	8	16	8	7	1 Mbyte	○
Intel 8086	1979	16	16	8	7	1 Mbyte	○
Motorola 68008	1985	8	32	12.5	16	16 Mbytes	○
Intel 80286	1984	16	16	16	7	16 Mbytes	●
Motorola 68000	1980	16	32	12.5	16	16 Mbytes	○
Motorola 68010	1984	16	32	12.5	16	16 Mbytes	●
Intel 80386	1986	32	32	20	7	4 gigabytes	●
Motorola 68020	1986	32	32	25	16	4 gigabytes	●
Motorola 68030	1987	32	32	25	16	4 gigabytes	●

●—Yes ○—No

dependently of other segments.

The 68020 has the advantage of providing true "virtual machine" support. A virtual machine is essentially a logical microprocessor that executes most instructions normally, but a program will cause a nonmaskable software interrupt when a privileged instruction is executed. The "supervisor" program then processes the privileged instruction in the appropriate fashion and allows the applications program to continue. This trick can be repeated to any number of levels, allowing an operating system to run another operating system as an application that can in turn run its own applications.

The 80386 contains a limited virtual machine capability called virtual 86 mode. Unfortunately, the virtual machine appears to be only an 8086, not an 80286 or 80386. The rumored 80486 is said to provide complete virtual machine support.

What does this all mean to a programmer and a user? A programmer will probably prefer the 68000 register and instruction set because of its regularity. The 80386's virtual 86 mode offers one possible way of running DOS applications under any operating system, but the lack of a full virtual machine mode prevents an operating system like OS/2 from running as a "guest" operating system. The 68020 has the virtual machine capability, but there is no corresponding 68000-based operating system that commands the same huge following as MS/PC-DOS.

Of course, users don't really care about such considerations as long as the applications run. The 80386 runs DOS and the forthcoming OS/2, and DOS can also be run using the virtual 86 mode with additional operating system support. Since the overall performance of the 80386 and the 68020 is about the same, the debate over their respective virtues remains one for the programmers.—William G. Wong

William G. Wong is director of PC Labs.

needs isn't on the agenda of IBM buyers.

In some areas, such as business graphics applications, PC software is way ahead. There's nothing in the Mac world even close to *Harvard Graphics* and Micrografix's *Windows Graph*, the two best graphing programs available for PCs—and dazzlers both on the Model 80.

And you can find a PC program to emulate almost any terminal you can imagine, from DEC VTs to HPs and Tektronix units. Terminal-emulation software is far behind on the Mac, though Apple's attention to connectivity, especially connections to mini and mainframe computers, should close that gap in the near future.

A second huge advantage in the IBM universe is that it's not just IBM's universe. The availability of good PC compatibles from a number of vendors—and inevitably, PS/2 clones from many of the stronger players in the compatibles game—gives buyers choices unknown to Apple customers. Indeed, the relatively high prices of Macintosh hardware are sustainable only as long as Apple has no competition from Mac clones. Competition in the IBM world also forces progress on a calendar not set by IBM; complacency in the PC market means Chapter 11.

How important is that monopoly on Macintosh hardware to Apple?

In a quick, witty and revealing *bon mot* at Esther Dyson's Personal Computer Forum in Phoenix last February, Apple president John Scully gave us a hint. Gordy Campbell, head of Chips and Technologies, whose chip sets have made it easy for many vendors to introduce PC-compatible hardware, was sitting next to Scully on a panel. As an afterthought to an answer to a question from the audience, Campbell turned to Scully and asked, "How'd you like a clone, John?"

"How'd you like a lawsuit?" Scully snapped. And he wasn't smiling.

As easy and cheap as connectivity is on the Mac, better connectivity is available—if more expensive—on IBMs. Novell's *Advanced NetWare*, the IBM Token-Ring Network, Ungermann-Bass's *NetOne* and other industrial-strength networks are built around the idea of connecting IBM PCs. When Macs get added to the list of products that can be connected to those networks, they're afterthoughts.

SCOREBOARD So how do the Mac II and the top-of-the-line PS/2 model stack up? On raw power they're very close, with the Model 80 slightly ahead. On availability and overall quality of software, the Model 80 edges out the Mac again, though narrowly—and the best programs for the Mac are the equals or better of the best PC programs. On connectivity, IBMs are ahead, if only briefly and at greater cost in price, complexity, and grief at installation time.

On ease and pleasure of use, the Mac's

In some areas, such as
business graphics
applications, PC software is
way ahead.

on top. Maybe the graphics interface of OS/2's Presentation Manager (and until then, *Windows 386*) will close the gap, but Macs, and especially the Mac II, are simply easier and more enjoyable to use.

On innovation, the Mac wins again. IBM deserves credit for the Micro Channel bus design—but the NuBus found in the Mac II is already a standard and capable of similar performance. Hatching a new, incompatible, and proprietary bus isn't always an occasion for celebration, as the PC world is discovering while it worries and wonders what the PS/2s and the Micro Channel Architecture really mean. In other areas, from display graphics to the user interface to support of PostScript and truly integrated systems, Apple has led the way.

Not so long ago, Mac versus IBM was an easy question to answer: Mac for home, IBM for work. We're not in Kansas anymore, Toto; the choices have gotten a lot tougher. The Mac II is no more going to displace PCs and PS/2s than BMW is going to put General Motors out of business.

But those Beemers do have a lot of appeal. And a lot of loyal owners. And a heck of a future. ☐

Jim Seymour is a contributing editor of PC Magazine.

DESKTOP PUBLISHING MOVES FROM MICRO TO MAX.



Moniterm introduces the 19" monitor.

A high resolution display system that offers **6 times** the viewing area of a micro dimension, low resolution monitor. An innovation that turns your microcomputer into a powerful Desktop Workstation, **by maximizing...**

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NO MORE MISSING LINKS:

Combining the particular talents of Macintosh and IBM-style systems is a challenge for managers in organizations that use both machines. The problem used to be finding a product—any product—to link the two worlds, but now there are lots of alternatives. The sudden growth of Mac-to-PC connectivity is bound to leave managers wondering which approach to choose.

SERIAL COMMUNICATIONS Hooking together different kinds of computers through their serial ports is an effective and often overlooked solution to system incompatibilities. Laptops, Macs, and DOS systems have a common connection through their serial ports that isn't often

available through network circuit boards. Northern Telecom is aggressively marketing this method of connecting dissimilar systems through its line of private branch exchange (PBX) telephone systems, particularly the Meridian SL-1.

Northern Telecom tested Macs running Palantir's *InTalk* software and Apple's *MacTerminal* on PBX systems. These programs worked well through the PBX and exchanged files with PCs running popular communications programs such as *Cross-talk* using the error-checking Xmodem public domain protocols.

Hayes Microcomputer Products markets both PC and Mac versions of its *Smartcom II* communications software, which accomplishes error-free file trans-

fers with a proprietary protocol.

While Northern Telecom is concentrating on PBX systems, these software combinations should work through almost any voice/data PBX or smaller data PBX system. (See "Making Connections: Data PBXs," Volume 6 Numbers 13 and 14, for reviews of PBX systems.) Of course, serial printers, modems, and the services of minicomputers can be shared among dissimilar microcomputers in the same way. Even with all the Mac/PC interconnection products available, using dissimilar microcomputers as terminals on a mini-computer (perhaps through a PBX) remains the best way to give people DBMS access to the same data files simultaneously.

APPLE/IBM NETWORKING

New hardware and software
products let Macs and PCs communicate
on their own terms.



COVER STORY FRANK J. DERFLER, JR.

■ CONNECTIVITY

FILE CONVERSION Moving files between the Mac's *Finder* operating system and an MS-DOS machine doesn't necessarily make them usable at the receiving end. Files in standard formats like ASCII and .DIF can be used without translation, but other file formats must be translated into some form usable for applications in the receiving machine. Several file-format translation programs are now available; perhaps the best-known is *MacLink Plus* from DataViz. This program translates common PC file formats such as Lotus's *1-2-3*, *dBASE II* and *III*, *WordStar*, and *MultiMate*. *MacLink Plus* also translates

Mac applications such as *Excel*, *Jazz*, and *MacWrite*.

Apple's own *File Exchange* software is scheduled for delivery in the third quarter of 1987, when it will be included in the system software of all new Macintosh computers.

RESOURCE SHARING Although printers, modems, and files can be shared among dissimilar computers through a PBX, the sharing activity isn't invisible, as it is on a good local area network using operating system redirection. In a typical microcomputer LAN, files and resources are

Linking the individual
productivity
tools on PCs and Macs
can result in a
synergy of computing
capabilities
for any organization.



shared through operating system commands that are redirected to the network for service. Because of the differences in operating systems and data-bus structures in Macs and PCs, it takes a special type of LAN to service both systems invisibly.

Since all Macintosh models and the Apple LaserWriter already contain an interface for the AppleTalk network, Mac-to-PC LAN developers usually concentrate on adapting the PC to AppleTalk. AppleTalk uses shielded twisted-pair wire on a simple 230-kilobit-per-second CSMA/CA network that is easy and inexpensive to install. Companies with PC-to-AppleTalk products include Apple, 3Com, Crescent Communications, and Centram Systems. Digital Equipment Corp. markets an AppleTalk-to-Ethernet (including DEC VAX) link. 3Com and Apple reverse the role and provide ways for Macs with slots to enter Ethernet.

Apple has announced several products to link PC standard systems and Macs. The EtherTalk Interface Card (scheduled for release before the end of this year) gives the Macintosh II a direct connection to Ethernet networks. *AppleShare* PC software (to be released in the first quarter of 1988) is Apple's way to let MS-DOS PCs share or gain information stored in the *AppleShare* file server. Several third-party vendors are already delivering good Mac-to-PC products as well.

Tangent Technologies markets PC MacBridge, an AppleTalk card for the PC and a series of software utilities that let the PC to use the resources of a Mac server and LaserWriter. Perhaps the company's most



FACT FILE

Crosstalk Mk.I

DCA Crosstalk
Communications Inc.
1000 Holcomb Woods Pkwy.
Roswell, GA 30076
(404) 998-7798

List Price: \$195

Requires: 128K RAM, DOS 2.0 or later.

Not copy protected

CIRCLE 676 ON READER SERVICE CARD

EXOS LAN family

Excelan Inc.
2180 Fortune Dr
San Jose, CA 95131
(408) 434-2300

List Price: \$995 to \$3,191, depending on installation design.

CIRCLE 679 ON READER SERVICE CARD

MacLink Plus

DataViz Inc.
16 Winfield St.
Norwalk, CT 06855
(203) 866-4944

List Price: \$195

Requires: Apple Macintosh 512. Not copy protected.

CIRCLE 674 ON READER SERVICE CARD

Meridian SL-I

Northern Telecom Inc.
2305 Mission College Blvd.
Santa Clara, CA 95054
(408) 988-5550

Typical Installed Price: \$85,000 for a system able to handle 50 simultaneous voice and data exchanges plus 15 voice trunks.

CIRCLE 677 ON READER SERVICE CARD

PC MacBridge

Tangent Technologies
5720 Peachtree Pkwy., #100
Norcross, GA 30092
(404) 662-0366

List Price: Board, \$250; *PC MacBridge* Plus package including software, \$375.

CIRCLE 675 ON READER SERVICE CARD

Smartcom II

Hayes Microcomputer Products Inc.
705 Westech Dr
Norcross, GA 30092
(404) 449-8971

List Price: \$149

Requires: 192K RAM, DOS 1.0 or later
Not copy protected.

CIRCLE 678 ON READER SERVICE CARD

J+Share

3Com Corp.
3165 Kifer Rd.
Santa Clara, CA 95052
(408) 562-6400

List Price: J+Share for PC servers (maximum five users), \$895; for unlimited users, \$1,790; J+Share software for 3Server3 (unlimited users), \$1,790. Copy protected.

CIRCLE 671 ON READER SERVICE CARD

TOPS

Centram Systems West Inc.
2560 Ninth St
Berkeley, CA 94710
(415) 644-8244

List Price: PC node, \$389; Macintosh software, \$149.

CIRCLE 672 ON READER SERVICE CARD

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1MB Memory	Standard
Memory Management	Yes
Storage	20MB
Small Footprint	Yes



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PC 11/23

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And its high performance 80286 microprocessor and 1Mb main memory



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This makes 3Station the optimized workstation

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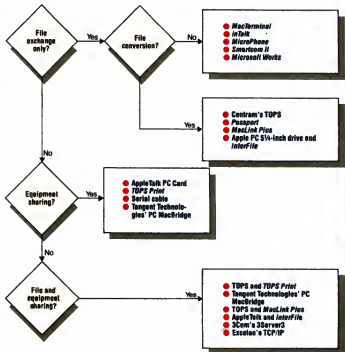


The Apple Macintosh-to-IBM PS/2 Connectivity Decision Guide

Exchanging files between the IBM and Macintosh worlds can be a simple matter if you don't need to convert the files from one format to the other. A communications program such as Hayes's *Smartcom II* or Apple's own *MacTerminal* will do the job.

If, however, you want to convert file formats as you exchange files, you'll need to look into hardware-based solutions like Centram's TOPS networking card or Apple's own 5 $\frac{1}{4}$ -inch disk drive.

Equipment sharing also requires hardware-based solutions, and if you need to achieve both file and equipment sharing in your setup, you'll have to look into true network-style arrangements such as 3Com's 3Server3, Excelan's TCP/IP protocol, or a full-fledged TOPS network.



interesting utility converts ASCII and other files to PostScript files for printing.

Centram Systems has made a special effort to link PCs and Macs through its TOPS products by including interface cards for PCs and software that allows PCs and Macs to share LaserWriter capabilities across the network. On a TOPS network, up to 32 computers (Macintoshes, UNIX-based computers, PCs, or any combination of the three) can share disk space, data files, and printers. Any machine on the network can act as a file server, including minicomputers running under UNIX. A TOPS node for the PC costs \$389, and the software for the Mac's built-in port is \$149.

On a more sophisticated level, Excelan provides wide-area and inter-network connections for both PCs and Macs through their Excelan and Kinetics product lines using the TCP/IP protocols. These protocols allow the interconnection of stations on huge networks like the Department of Defense's ARPA NET or Defense Data Network.

3Com Corp. shows its dedication to Mac-to-PC connections by including an AppleTalk port in every 3Server3. Its 3+Share networking software is fully compatible with the *AppleShare* software that provides file server capabilities within a workgroup of Macs. In another interconnectivity approach, 3Com has announced

a line of Ethernet network adapters for the Mac SE and Mac II that will run under a version of 3+ on the Mac.

SYNERGY Linking the individual productivity tools on PCs and Macs can result in a synergy of computing capabilities for any organization. You can choose between relatively simple serial port connections and more complex but capable LAN functions. Each machine has its own strengths, but now both have several common ways to exchange and share files and resources.

Frank J. Derfler, Jr., is a contributing editor of PC Magazine.



The New Standard Bearer.



THE SOFTWARE LINK

A Number of Reasons A Number

1. Designed for the 80386

There's a revolution taking place in desktop computing. A revolution that's been launched by a square wafer of silicon known as the 80386 microprocessor chip. It puts minicomputer potential at PC users' fingertips. It's a fact that virtually every leading PC manufacturer has built a "box" around this chip. And it's a fact that the "New Operating System" will, supposedly, even run on it. But, it's also a fact that *their* system wasn't designed for the 80386. Ours is. And it's called PC-MOS/386™



2. PC and PS/2 Compatible

In designing PC-MOS, we knew our first priority was to exploit the minicomputer capabilities of 80386-based PCs & PS/2s. But we went further, and developed a system which would be fully existing PCs, PC ATs, and sacrifice. You'd expect nothing less from the new standard bearer.



compatible with the millions of PC-compatibles. Power without nothing less from the new standard bearer.

3. One, Five, Up to Twenty-five Users

From the beginning, PC-MOS/386™ was designed as a versatile operating system which could support twenty-five users as easily as it supports one. The system comes in single, five, and 25-user modules, so you're able to start with what you need and expand when you're ready.

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4. Thousands of DOS Programs PC-MOS/386™ gives you the best of the past, and the best for your future. Which means that while PC-MOS/386™ totally replaces your old DOS, you won't have to replace the programs you've spent a lot of time learning.

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5. Familiar Commands Like DIR and COPY

Just as you don't have to learn a whole new array of software to take advantage of PC-MOS/386™ neither do you have to learn an entirely new set of commands.

Instead, the system builds on the knowledge you already have. "COPY" still copies files, and "DIR" still gives you a directory listing. As you might expect, we didn't stop there. There's a wealth of features that have strengthened the commands you know, making them more powerful and easier to use.



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of Users Will Choose PC-MOS/386™

6. Concurrently Supports Virtual 8086 and 80386 32-Bit Mode



80386-based PCs & PS/2s are dual-personality computers. To run DOS programs, they act as PCs with a 640K memory limit. But to take advantage of their minicomputer capacity, they operate in true 80386 mode which lets them address up to four gigabytes of memory. PC-MOS enables the 80386-host and its workstations to independently switch between these modes—making DOS compatibility and 80386 power simultaneously possible.

7. Multi-Tasking

While it's true you could look elsewhere for multi-tasking, why would you want to? The *other* multi-tasking operating system is not now, nor is it planned to be, multi-user. It won't even run multiple DOS applications in multi-tasking mode.

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8. File/Record Locking and Security

When you decide to implement either a network or a multi-user system, there's a two-fold problem which must be solved: protecting your work from accidental misuse and securing it from intentional theft.

PC-MOS/386™ solves both aspects of this problem. Password protected security allows you to assign file, directory, and task access to each user. Plus, files and records are locked using either PC-MOS' proprietary system or NETBIOS emulation.

9. Remote Access



It's been said that information is power...which makes PC-MOS/386™ a deadly weapon to your competition. Imagine on-the-road salespeople being able to file call reports and access your latest inventory data. Picture executives being able to access your corporate database from across the country, or around the world—giving them the information they need, when they need it.

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10. The Price...As you evaluate operating systems, ask yourself if it's reasons you're considering...or rhyme. Ask if you're getting a system for tomorrow, or one that was made for yesterday. See if you're being forced to buy new hardware because of *their* software.

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Only one operating system in the world can give you the raw power, features, and functionality that you demand. Its name is PC-MOS/386™. And it's immediately available in one, five and 25-user versions starting at \$195.



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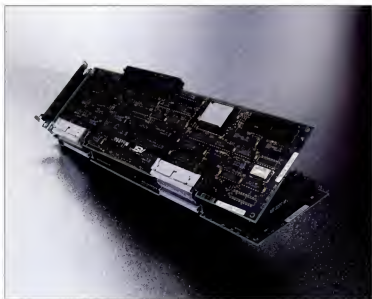


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DOUBLING UP:

The Mac286 board represents an ambitious step toward resolution of the conflict between IBM's and Apple's separate operating environments.

COVER STORY BILL O'BRIEN

Over the years, there have been periodic attempts to resolve the conflict between Apple's and IBM's separate operating environments. Quadram offered an Apple II simulation on a plug-in board, the QuadLink. Dayna Communications' MacCharlie added an IBM clone to the Macintosh, with the Mac acting as a terminal to DOS operation. Software solutions have included several levels and versions of file transfer utilities. All of these attempts have been bold, but none have been so ambitious as AST's Mac286 for the Macintosh II.

Occupying a brace of adjacent expansion slots, the Mac286 processor board and 640K RAM board are a simple plug-in addition to the Mac II. There are no tedious cables to string across the back, side, or bottom; the boards come with their own cables bridging the connections between brains and memory. The most tiring task is stringing the disk drive cable from the rear of the processor board to the floppy disk drive. All other ports—video, serial, and keyboard—are shared Macintosh resources. Hard disk space is claimed by cre-



Mac286
 AST Research Inc.
 2121 Alton Ave.
 Irvine, CA 92714
 (714) 863-1333
 List Price: \$1,499
 Requires: Two expansion slots.
 In Short: An expensive and problematic solution to Mac-PC compatibility.
 CIRCLE 964 ON READER SERVICE CARD

AT—no mean trick for a coprocessor running in a 16-MHz environment. Unfortunately, the video processing looks as if it was borrowed from a Commodore PET 2001 of the late seventies. Scrolling is as flicker-full as any you could imagine, and slow at best. It's a consequence of attempting to simulate a character environment in a graphics-oriented world.

In fact, emulating an IBM on a Macintosh is full of pitfalls. While you get full control of the Mac's mouse, it is valid only

processor is running as a window within a Macintosh software package to supply all of the emulations.

COMPATIBILITY COSTS And you will be stung by the price. The Mac286 retails at \$1,499. Just the research and development necessary to put an IBM AT into a Macintosh (not to mention the licensing fees paid to Phoenix Technologies to ensure that the resulting product would be compatible) can justify that price tag. But you can buy a monochrome AT clone for \$300 more or an EGA clone for \$800 more. With the Mac286 boards in your Mac, you've effectively purchased a slotless AT. If I'm not mistaken, one of the chief complaints about the Macintosh was that it had no slots, no expansion capability, no growth.

So why bother? Desk space is the most pressing reason. One computer on your desk is enough, especially now that Apple has enlarged the Mac. Two are tenable only if you're intent on building a fortress around yourself. Justification is another reason. A \$2,000 expense for a CGA

AST PUTS DOS ON THE MAC

ating a Mac286 file on the Macintosh hard disk; you reserve as many megabytes as you are willing to lose from the Mac. Normal video emulations include both monochrome and Hercules graphics, but if you've invested in a color interface board and monitor for the Mac, Mac286 will also do its best to resemble a CGA system.

BENCHMARK TESTS PC Labs processor benchmark tests show that the Mac286 has all the speed of an 8-MHz

for accessing the Mac286 menu bar at the top of the screen. There is an option to switch to an emulated Microsoft mouse, but even the Mac286 documentation suggests that such an imitation is in form only and almost useless indeed. The CGA display is barely half as deep as the standard Mac II display, and that's a small area in which to cram 24 lines of text. You fare better with monochrome and Hercules emulation. Each almost fills the screen—but not quite. After all, the 80286 micro-

80286 clone is a hefty price to pay if you have only an occasional use for it. You'd probably feel better pocketing the \$500 savings the Mac286 offers, knowing that you had both Mac and IBM compatibilities. And as the Mac and the IBM draw closer together in function, feature, and form, you may be glad you have that compatibility. □

Bill O'Brien is a project leader in PC Labs.

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Rim System
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Processor
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Lotus 1-2-3
Symphony
PC-Paintbrush

COMPUTER-AIDED DESIGN

AutoCAD
Cadvice
In-A-Vision
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SCREEN GEMS

With their crystal-clear characters and big display areas, monochrome monitors from Taxan, Sigma, Wyse, and others breathe new life into the black-and-white-monitor market.

Some things were meant to be black and white: *Casablanca*, *Citizen Kane*, *The New York Times*, and—for some applications at least—PC displays. Cinephiles are fighting colorization, and we wonder what would happen if *USA Today* bought the *Times*, but black-and-white monitors are more popular than ever. The single greatest force behind this renewed popularity is desktop publishing: for page layout and marathon word processing, nothing beats the crisp images and large screens of the current crop of monochrome displays.

■ PAPER-WHITE MONITORS

In some ways, the resurgence of monochrome is a throwback to the early days of PCs. The very first hackers-only-need-apply personal computers (Apple, Ohio Scientific, Sinclair, and such) were often connected to the family television set by way of a radio-frequency (RF) modulator. The resolution was awful, but it got the job done—and the price was right.

Next up the ladder of antiquity were the first composite monochrome monitors, most of them originally designed for closed-circuit television applications. Their superiority was due not to better electronics or picture tube development, but simply to the elimination of the undesirable (RF) modulator.

The transistor-transistor logic (TTL) coupled monochrome monitors that followed were things of sheer beauty. By using digital rather than analog signals, monitor makers achieved resolution that rivaled many of the mainframe terminals of the time. TTL monochrome monitors remain the tube of choice for many text-file intensive users today.

And then, of course, there's the polychrome world. Color monitors have a way of instantly impressing neophyte users and paint program aficionados, but they're merely acceptable, at best, for marathon word processing and, to some extent, CAD and graphics.

All of which leads us back to the latest breed of paper-white monochrome monitors. No, the living room TV will never come back into favor, but these extraordinarily high-resolution one-color displays will delight many. They offer not the early light-gray-on-dark-gray image conveyed by the early CCTV monitors, or even the more widely accepted green and amber phosphors; the current breed of monochrome monitors is genuinely jet black on paper white.

Much of this resurgent interest in black-and-white monitors is attributable to the success of Apple Computer's Macintosh, which is interesting when you recall doom-sayers' predictions that the Mac's lack of color would spell its downfall. In a sense, the PC community is once again following in the footsteps of veteran Apple owners.

Equally as instrumental in the monochrome resurgence is the popularity of desktop publishing, whose users want a

crisp black-and-white image that clearly illustrates what will appear on the printed page. This becomes all the more important as laser and 24-pin dot matrix printers rise in popularity.

What - you - see - is - what - you - get (WYSIWYG) is a hackneyed phrase

■ Desktop publishing users want a crisp black-and-white image that clearly illustrates what will appear on the printed page.

among word processor publishers, but it's an absolute necessity in desktop publishing. Although WYSIWYG word processors may offer video display of centered, boldface, or italic text, the text is usually displayed within the conventional 80-column by 25-line display window. That's fine for scrolling through documents, but it doesn't help you see how the finished page will look.

Most of the more ambitious desktop publishing packages aim to display a video image that is *exactly* like the one that will roll out of the printer, and with good reason. It's far easier to understand a mixture of 24-, 10-, and 6-point typefaces, along with lines and graphic images, when you can see it on the screen.

Video display resolution (measured by the number of pixels that can be mapped out to the screen) is a primary consideration for desktop publishing applications. The original IBM Color/Graphics Adapter's 640- by 200-pixel measure (in monochrome mode) falls flat on its face for these programs (and, indeed, many consider it unacceptable for any extended text use). The 640 by 350 performance level of the Monochrome Display Adapter and Enhanced Graphics Adapter is a little better, but the former adapter suffers from a lack of graphics capability, while the latter offers color capabilities that aren't really

needed in text-intensive applications.

The Video Graphics Array used in IBM's new PS/2 line gets better still, with 640 by 480 resolution. The Professional Graphics Adapter offers similar performance, but it never really caught on and is now pretty much a dead horse. Hercules countered IBM's original choices (CGA and MDA) with the Monochrome Graphics Adapter, yielding 720- by 348-pixel performance, and it has enjoyed well-deserved acceptance. Furthermore, it established that "nonstandard" display systems could go up against Big Blue and occupy their own (profitable) niche.

SPECIAL Ks Serious desktop publishing users, however, are looking for something more in the 1K- by 1K-pixel range—a territory formerly reserved for true mainframe graphics workstations. A number of graphics card/monitor combinations are available today (and at not-unreasonable prices) to elevate the PC to those heights.

The point of the resolution-horsepower war isn't to see which monitor can pack the greatest number of discrete lines into the corner of the screen, but rather which can show the largest image in one picture. A whole page is great, but two pages on a single screen make the task even easier.

Such high resolution comes at a price that is at once expensive and a bargain. Conventional display adapters normally utilize the computer's CPU to map the video memory space, which is cheap but slows the system down to a snail's pace. Most high-performance monochrome monitor systems utilize an adapter incorporating a video coprocessor, such as Intel's 82786, Texas Instruments' 34010, or Hitachi's 63484. This frees the host processor from mundane video signal processing chores and greatly increases the speed at which an image is mapped to the screen—a virtual necessity when as many as 2 megabits of pixel information need to be planted on the screen *right now*.

As you might expect, there's a price to pay for this vaunted performance. These monitor/adapter combinations can cost more than the PC with which they are used.

Much of the credit for the enhanced performance of these monitors goes to the



e wrote the catalog on laser printing.



This spring, a company called Laser Connection introduced a new concept to laser printing.

It didn't come in the form of hardware, or software.

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Where to find our guide in the field
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connection[™]**

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■ PAPER-WHITE MONITORS



Paper-White Monitors: Summary of Features

(Products listed in ascending price order)

List price	Wyse WT-780 \$990	Thomson 980W \$1,095	Texas Crystal View \$2,195	Monitorm Viking I \$2,365	Signa LaserView \$2,395
Max. pixel resolution	1,280 x 800	1,280 x 1,024	1,280 x 960	1,280 x 960	1,664 x 1200
Diagonal display size (inches)	15	20	19	19.6	19
Controller	Motorola 6845	AGC	TX-1280	HD6384	LDA-1200
IBM modes emulated	CGA, MDA	CGA, MDA, Hercules, EGA	CGA	CGA, MDA, Hercules	None
Drivers	AutoCAD, GEM, Microsoft Windows, 1-2-3	AutoCAD, Microsoft Windows, 1-2-3	AutoCAD, GEM, Microsoft Windows, Ventura Publisher	AutoCAD, GEM, Microsoft Windows, 1-2-3	AutoCAD, Microsoft Windows, 1-2-3, Ventura Publisher
Mouse controller on-board	○	●	○	○	○
Bus	8/16-bit, automatic selection	8/16-bit, automatic selection	8/16-bit, automatic selection	8/16-bit, automatic selection	8-bit
Internally powered	●	●	●	●	●
Monitor-powered	●	○	○	●	●
Primary display capability	●	●	●	●	○
Secondary display capability	●	●	●	○	●
Max. bus speed	6 Mhz	6 MIPS	16 Mhz	12 Mhz	12 Mhz
Tilt/swivel base	●	●	●	Tilt only	○
Cable length (feet)	3	6	6	3	6
CONTROLS					
Brightness	○	●	○	●	●
Contrast	○	●	○	○	○

PC—Indicates Editor's Choice ●—Yes ○—No

latest developments in the phosphors and masks used in CRT manufacturing. No longer is "black" a pale shade of gray while "white" is a whiter shade of pale gray. With their crisp black images on snow-white backgrounds, these monitors look more like a printed page than a conventional monitor. Just try that on an old composite monochrome monitor! Contrast is another strong point of the paper-white monitors. This is what allows carbon-black characters or graphics images to be displayed on a clean, white background, just as they would on a printed page. WYSIWYG goes from a slogan to a reality with such a display.

Wondrous though they are, these monitors still have problems. All of the effort that goes into making a sharp, high-resolution screen will have been wasted if the glare level is high enough to preclude the long hours needed for most desktop publishing sessions. Although etched screens and those covered with fine nylon mesh

may degrade the resolution slightly, they may also prevent Excedrin headache number 12,564. A better solution would be magnesium fluoride antireflective coating

■ The single biggest consideration for ultra-high-resolution monochrome monitors is software drivers.

(similar to that used on some DEC terminals). Some of the glare problems can be reduced by the use of a tilt-and-swivel base.

Physical size is a matter of both functional and ergonomic importance. The

really big 19- and 20-inch monitors will be hard-pressed to fit on a desktop less than 30-inches deep, and they look absolutely ridiculous on top of one of the small-footprint AT clones. The best bet in this case is to invest in a bracket to mount the PC on its edge on the floor next to the desk, small-footprint box or not.

DRIVING FORCES The single biggest consideration for ultra-high-resolution monochrome monitors is software drivers. There is no such thing as a graphics standard here. None of the advantages of a high-resolution paper-white display will be apparent if you're forced to use them in partial-screen CGA-emulation mode (or in some cases, no mode at all). Get one that supports your favorite applications, and you'll be as pleased (well, almost) as the new owner of a Ferrari 166MM Barchetta roadster. The wrong choice will make you wonder why you spent all of that money for a turbocharged Yugo.



Give your HP LaserJet the desktop publishing power you thought it had.



PS Jet & PS Jet + PostScript upgrade kits

It can be frustrating to realize your HP LaserJet™ falls short of true desktop publishing capabilities. A PS Jet™ or PS Jet +™ upgrade kit from Laser Connection lets you correct that shortcoming. These upgrades incorporate the advanced print technology of QMS, Laser Connection's parent company, with 10 years' experience in developing print system technology.

Each upgrade kit adds the power of the Adobe PostScript® page-description language, the accepted standard for desktop publishing. They're the only such upgrades available for the HP LaserJet and other laser printers that use the Canon® CX® engine—Canon, NCR™, QMS, Talaris, CPT, and more.

Master a new language PostScript gives you the ability to exploit the full potential of desktop publishing. It takes you far beyond mere word processing to give you total control over the final appearance of your documents. Place text and graphics anywhere on the page. Design and redesign every detail to your liking. The end result is the high-quality output that you require.

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■ PAPER-WHITE MONITORS

To help with your decision, we've taken a close look at paper-white offerings from Monitorm, Taxan, Thomson, Sigma, and Wyse. AST and NEC's products were not yet available at press time. Conographics is in the process of upgrading its unit and declined to send *PC Magazine* its present system for review.

MONITERM CORP.

Monitorm Viking I

High-performance graphics terminals for systems from Sun Microsystems, Compu-graphic, and others have been the mainstay of Monitorm Corp.'s business for the past 9 years. It's only within the last 2 years that the company has entered the retail business with products under the Monitorm label. Viking I, Monitorm's curious moniker for its ultra-high-resolution (1,280 by 960) monochrome display, conjures up images of Hagar the Horrible, but that's hardly the case. Imagine, instead, a monitor of surprisingly compact dimensions given its 19-inch screen, connected to an exquisitely fast display adapter, along with a decent assortment of driver software, and you'll get the big picture.

You may be skeptical at first—the Viking I looks too small and weighs too little really to be a 19-inch monitor, but look more closely. Not only does the CRT measure 19 inches diagonally, but the plastic bezel around it is designed so that none of



Compact and well made, the ultra-high-resolution (1,280-by-960-pixel) Monitorm Viking I is well suited for desktop publishing and CAD. The video board is powered by the monitor, not the PC.

that image is cropped off. The rest of the enclosure is made of steel (possibly to reduce RF interference) and looks as though it should weigh a ton. In fact, the Viking I is surprisingly light and rested comfortably on top of an AT without provoking the case-squashing fears prompted by some of the competing units.

The Monitorm's case is adjustable for tilt only, by means of a single screw-out rear foot. With the foot at its innermost position, however, the display screen is nearly vertical, so it's not likely to be tilted very often. The only external controls are the rear-mounted brightness control and power switch. The short, 3-foot video cable will have to be replaced if you intend to mount the computer anywhere other than directly underneath the display.

Although most of the advanced video boards appearing on the market to date have been powered by Intel or Texas Instruments graphics coprocessors, the Monitorm board utilizes a Hitachi HD63484P8 Advanced CRT Controller (ACRTC).

Overall board construction quality was

judged to be excellent. The coprocessor, ROM, and 13 programmable logic array (PLA) chips are socketed, with the other components soldered directly to the single board. A total of 40 jumpers mounted in eight blocks are used to ready the board for a variety of system configurations, but be cautious when moving them around—only four blocks are mentioned in the manual. Make a mistake, and you'll have to call the manufacturer for help.

The 63484 ACRTC updates the video display at a blistering pace. Much of this is attributable to native commands for such graphics functions as drawing lines and circles, area fills, and zooming and panning. Part of the ACRTC's speed can be ascribed to full support of IBM's 16-bit bus, found in the AT and compatibles. Owners of PCs and XT's will be happy to find that their 8-bit bus machines will function just fine (albeit more slowly) if they change just a single jumper.

Even better news is that PC owners won't have to update their power supplies to use the Monitorm board: it's powered by the monitor, not the computer. This may



FACT FILE

Monitorm Viking I

Monitorm Corp.
5740 Green Circle Dr.
Minnetonka, MN 55343
(612) 935-4151

List Price: \$2,395

Requires: 512K RAM; full-length slot;
CGA, MDA, or Hercules adapter board;
DOS 2.1 or later.

In Short: A well-made, compact monitor connected to a fast display adapter makes this a fine choice for desktop publishing and CAD. The limited display size when used with other software makes it less appealing as the sole monitor on a system.

CIRCLE 101 ON READER SERVICE CARD



**The new
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QMS-PS 800 II
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The PostScript laser printer sure to get high ratings at its network debut.

The QMS-PS[®] 800 II is an 8-page-per-minute laser printer that combines the desktop publishing power of Adobe PostScript[®] with the superior printer technology of QMS, a leader in printer technology for 10 years. Exceptional paper handling, faster processing speed and a Canon[®] CXD[®] print engine with 10,000-page-per-month duty cycle give QMS-PS 800 II the versatility you need on your PC network.

A network sensation QMS-PS 800 II holds 500 pages, so operators aren't constantly refilling depleted paper trays. Users can even designate automatic switching between the two trays for doing letterhead/second page printing. Select faceup or facedown collation. And manually feed odd-sized paper stock.

With QMS ASAP[™] (Advanced System Architecture for PostScript) proprietary technology, QMS-PS 800 II delivers outstanding performance. In fact, the more complex the page, the more it outperforms other PostScript printers. Two megabytes of memory, expandable to three megabytes, also add to the overall page processing speed when you are creating complex documents.

Type casting The QMS-PS 800 II comes with 35 resident typefaces (you can download more if you like). PostScript allows you to scale type to virtually any size, from minuscule to mammoth. PostScript also enables you to design, and redesign, your documents with exacting detail. You have total control over the final appearance of documents, with the ability to place text and graphics anywhere on the page. In short, you get the complete desktop publishing power that only PostScript can give you.

Critical acclaim The QMS-PS 800 II is certain to receive rave reviews on your network. And for a single-user set-up, there's the QMS-PS 810 laser printer. For a demonstration of either, call **1-800-523-2696** for the location of the Laser Connection dealer nearest you. And be sure to ask for *The Sourcebook*[™] - our exclusive catalog filled with the latest laser printer products and enhancements.

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■ PAPER-WHITE MONITORS

have been done out of necessity, because the board gets very hot after as little as 1 hour of use, suggesting high power consumption.

The Viking I's display leaves little to be desired for desktop publishing and CAD applications. Resolution is about mid-pack, at 1,280 (vertical) by 960 (horizontal). In this field, however, mid-pack is better than anything the color monitor crowd has to offer, by a factor of about four to one. The noninterlaced image is completely flicker-free, and the image is devoid of linear distortion. In white-on-black mode (as is commonly preferred for CAD applications), a higher brightness level would be appreciated. Glare from the nonetched CRT is annoying in a brightly illuminated environment. Image quality is sharp all the way to the corners.

Most paper-white monitors (or, more properly, their display adapters) emulate one or more of the lower-resolution video standards (CGA and MDA), but Monitorm does it with a twist. The video output from one of these "standard" boards is fed into the Viking I display adapter by way of a 12-inch cable. The image is then digitized and displayed on the paper-white monitor. Monitorm refers to this video adapter system as the FrameGrabber, and while it does work, there are two problems. First, you have to buy a conventional display adapter, and you'll need a free slot to plug it into. Second, and more disappointing, is the squinty little image that appears on the screen when you're using a CGA adapter. The image is displayed in the same resolution as on a conventional monitor. The result is that a full-screen CGA image shows up as a lilliputian 7/4-inch (diagonal) vision at the top center of the display. A Hercules graphics adapter fares somewhat better, filling approximately two-thirds of the screen. With the software for which this monitor was intended, however, the Viking I works just fine.

Three disks packed with the Viking I provide software drivers for *Microsoft Windows*, *GEM*, *AutoCAD*, *Ventura Publisher*, *PageMaker*, 1-2-3 (both graphics and 134-column by 68-row spreadsheets), and *Symphony*. One of the disks is a programmer's tool kit, which is handy if you want to take up the arduous task of writing

your own device driver for some other application.


The Viking I holds its own against its competitors when used with an application for which it was really intended—desktop publishing or CAD. Although the ability to display lower-resolution images will do in a pinch, the resulting tiny image will put your eyesight to the test.

◆ ◆ ◆ ◆ ◆ SIGMA DESIGNS INC.

Sigma LaserView

Sigma Designs got its start in 1982, making memory and multifunction boards for the IBM PC, and has since branched into the high-resolution graphics display business. With its 1,664 by 1,200 resolution, the LaserView has the sharpest image of the lot.

None of the other monitors reviewed here is capable of the fine, crisp image of the LaserView. This is equally apparent in both desktop publishing and CAD applications. Gray tones are rendered accurately, and there is no evidence of linear distortion. The slightest bit of fuzziness can be

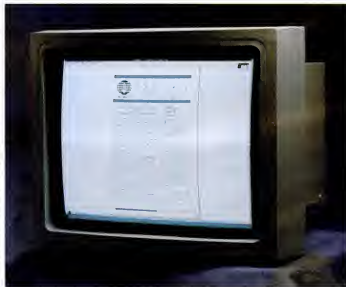
**FACT FILE**

Sigma LaserView
Sigma Designs Inc.
46501 Landing Pkwy.
Fremont, CA 94538
(415) 770-0100
List Price: \$2,395
Requires: Full-length slot; second monitor and display adapter; DOS 2.0 or later.
In Short: Extremely high resolution makes this a natural for the most demanding applications. Unfortunately, the inability to display conventional text images requires the use of a second monitor. A revised model, due out in October 1987, should remedy this.

CIRCLE 606 ON READER SERVICE CARD

seen at the corners, but it really doesn't detract from the overall fine image. The speed at which the display is drawn is faster than you'd expect, considering that there are nearly 2 million pixels that have to be mapped out.

Like the other monitors, the LaserView suffers from the familiar glare problem. The shiny picture tube necessitates careful



The Sigma LaserView monitor is housed in a svelte metal case hardly bigger than its 19-inch picture tube. The LaserView, with 1,664-by-1,200-pixel resolution, has the sharpest image of all.

unny, they run the same engine, but the QMS KISS^{plus} gets better mileage.



	QMS KISS ^{plus}	HP LaserJet Series II
Engine	Canon SX 8 ppm/300 × 300 dpi	Canon SX 8 ppm/300 × 300 dpi
Emulations	4, 6, or 7	1
Resident fonts	24 or 34	6

Think of it as a form of supercharging. The new QMS KISS^{plus} laser printer takes you further with the higher-resolution Canon[®] SX[™] engine than the Hewlett-Packard[®] LaserJet Series II[®]. Because where HP restricts growth to simple memory upgrades, QMS expands both memory and capabilities. As a result, QMS KISS^{plus} sets new standards of value and performance, standards first set by QMS with the QMS KISS[™] laser printer.

Three ways up QMS KISS^{plus} is the first laser printer that lets you choose the level of functionality you need, by offering three personality modules.

So if you're working with text and business graphics only, personality module 10 gives you 24 resident fonts, 512K RAM and four printer emulations (ANSI X 3.64, Epson[®] FX 80, Diablo[®] 630 and QUME[®] Sprint II[®]).

To combine text with more sophisticated graphics, personality module 20 moves you up to 34 fonts, a full megabyte of memory and six emulations (IBM Proprinter[™] and HP LaserJet[™], plus the four from module 10).

For text and full-page graphics, the 2.5-megabyte memory and HP-GL[™] plotter emulation of personality module 30 handle the most complex projects. Also included are the same 34 fonts and six emulations from module 20.

There's more. An easy-to-read, easy-to-use front control panel. Two font cartridge slots for using a wider variety of fonts. An easy-to-maintain design for clean, simple upkeep. And the new Canon SX print engine gives you richer-looking printouts.

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■ PAPER-WHITE MONITORS

placement to reduce the light coming over the viewer's shoulder.

The monitor itself is housed in a svelte metal case that is hardly bigger than the 19-inch picture tube. The plastic front bezel doesn't reduce the usable area as some of the others do. A single screw-in rear foot can be used to adjust the viewing angle slightly, but a tilt/swivel base would be better.

If the physical description sounds a little like that for the Monitorm Viking I, well, that's because Monitorm actually manufactures the display, which Sigma then acquires by way of the OEM market. The Sigma display board, however, makes all the difference.

The graphics adapter consists of a full-length board with a like-sized daughter-card attached to it by a header and six plastic standoffs. As to what makes it tick, it's anybody's guess, because someone at Sigma sandpapered off the markings from all of the components on the unit sent for review.

What we can report is that the boards' construction quality was about average, with one cut tracing and a pair of wire jumpers the only things appearing out of line. A bank of four DIP switches is used to select the I/O address, and a single jumper selects the appropriate bus speed, from 4.77 MHz to 12 MHz. Although the 16-bit bus structure of the AT is supported, the board will also function with the 8-bit bus found in PCs and XT's.

Drivers are supplied with the package for Microsoft Windows, GEM, Ventura Publisher, AutoCAD, I-2-3, and Symphony. If you have visions of 200-column by 100-row spreadsheet screens, however, forget it. Only the graphics are displayed on the LaserView—the spreadsheet and any other text (other than that within a desktop publishing screen) will be displayed on another, conventional (CGA or MDA) monitor. With no emulation mode, a second monitor becomes a necessity rather than an option.

Also bundled with the package is Z-Soft's *PC Paintbrush* with a driver for the LaserView. This freehand drawing program is particularly well suited to the big, sharp display and works well for creating pictures to incorporate into a desktop publishing work.


The LaserView is the most specialized paper-white monitor of the lot, and if you're looking for the sharpest image obtainable for the software it supports, this is it. Its lack of conventional text capability, however, confines it to those applications. Patience has its rewards, however, and by the last quarter of this year, a revised model should be available that will offer CGA and Hercules emulation. Such single-display capabilities, once available, will greatly extend the usefulness of the LaserView.

TAXAN USA CORP.

Taxan Crystal View

Taxan's first monitor was designed for the Apple II in 1981. Since then, the company has been an OEM supplier to companies such as Osborne, Sinclair, Acorn, Eagle, and others. Its current monitors—about 20 of them—are marketed largely under its own label.

Crystal View is a wholly appropriate name for its 19-inch monochrome display. Capable of 1,280- by 960-pixel resolution



EDITOR'S CHOICE
FACT FILE

Taxan Crystal View
Taxan USA Corp.
18005 Cortney Ct.
City of Industry, CA 91748
(818) 810-1291
List Price: \$2,195
Requires: 128K RAM; full-length slot; DOS 2.1 or later.
In Short: A great, big, clean, white display that makes desktop publishing and CAD a joy. Excellent CGA emulation makes it suitable as the sole monitor on the system for just about any other software application as well.

CIRCLE 11 ON READER SERVICE CARD

and equipped with a crisp black-and-white display, this monitor/controller combination shines at everything it does, from desktop publishing and CAD to ordinary DOS applications.

The display screen is distinctively high-contrast, with cloud-white characters displayed on a coal-black background. With the appropriate software (such as *Ventura Publisher*), the screen can also produce a



The Taxan Crystal View is a suitable name for this 19-inch monochrome display. It is capable of 1,280- by 960-pixel resolution and is equipped with a crisp black-and-white display.

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CIRCLE 126 ON READER SERVICE CARD

■ PAPER-WHITE MONITORS

black-on-white image, just like the final printed product.

Contrast is one of the Crystal View's strong points. The phosphor used works equally well at displaying black text on a white background as it does in showing white line drawings against jet black (as many AutoCAD users are likely to use). The image does wash out slightly in the brightest office environments, but no more so than the others.

Linear distortion is conspicuously absent from the Crystal View monitor. Both vertical and horizontal lines were perfectly straight, from center to corner. Chalk up another point for this display in CAD applications.

Screen glare is comparable to that of most other monitors tested, which is to say higher than desirable. An antireflective coating would be most welcome here. A partial solution comes in the form of a tilt-and-swivel base on the monitor. More likely, though, this will be used to move the monitor around to a viewing angle more comfortable for the operator and the jealous friend looking over his shoulder.

THE BIG PICTURE The Crystal View is packaged in an obese plastic enclosure that makes even a full-size AT look elfish underneath it. Indeed, it was heavy enough to raise some fears of crushing the CPU, but happily that didn't occur. Think twice before resting it on top of a plastic-cased PC clone.

Although the screen is listed as a 19-inch unit, the plastic front bezel reduces the screen area by half and inch. An insignificant discrepancy, really, but worth mentioning.

The display adapter cord is permanently attached to the monitor, and not without reason—the pinout for the cable is not the same as that of other video displays. The display and adapter are only meant to be used with each other, and plugging either into an incompatible device could send your computer up in smoke. The 6-foot cable allows the PC to be moved next to the desk.

The display adapter is built around the Intel 82786 video controller chip, which produces 1,280- by 960-pixel resolution, about average for paper-white monitors. Sixteen 4164 memory chips, 13 PLAs,

and a number of supporting ICs round out this fairly well-made board. The 82786, PLAs, and single ROM chip are all socketed (perhaps for future upgrades), while the other components are soldered into place. Only one wire jumper, soldered to an up-turned IC leg, appears out of place. The manual cautions against installing this board in an early PC without first upgrading the power supply to XT specifications, and you'd best heed this advice. This card sucks up the 5-volt supply to the tune of 3.5 amps, much of which manifests itself in the form of heat. The manual suggests allowing the unit to cool down for 15 minutes before handling the board, and I can recommend likewise—it became too hot to handle after as little as 30 minutes of operation.

A single block of four jumpers resides on the board to select the hardware interrupt vector, necessary for using the TX-1280 controller when a second monitor is installed on the system. That second monitor (the modern equivalent of the black Model T) can be anything you like, as long as it's connected to a monochrome display adapter—no CGA, EGA, or VGA allowed. This sounds reasonable enough—an MDA unit handling the text, while the Crystal View concentrates on graphics.

To reduce this need for desktop acreage for two monitors (not to mention the expense), the TX-1280 controller can emulate a standard IBM CGA much better than most others. The resulting image fills the entire screen, something that can't be said for some of the competition. The CGA image clarity makes the use of a second monitor superfluous. Few conventional monochrome displays are as good as this CGA pretender. Furthermore, shades of gray are surprisingly accurate.

FINE-TUNING As with the other products in this group, the big Taxan monitor is a brand-new product; hence the meager software support available at press time. The drivers supplied with it include only AutoCAD, GEM, Microsoft Windows, and Ventura Publisher. More are sure to follow as these units catch on. In the meantime, the ability to run most other software in CGA mode adds a lot to its usefulness.

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■ PAPER-WHITE MONITORS

really. The full-length display adapter utilizes only IBM's 8-bit bus architecture as found in the original PC. Sure, it will work in an AT, but the slowdown of the restrictive little bus is occasionally noticeable, particularly with demanding packages like *AutoCAD*. A scheme that Taxan refers to as "font caching" speeds things up considerably during desktop publishing applications, though.

With everything in proper perspective, then, this is certainly a very fine paper-white display package and one that merits thoughtful consideration for your high-resolution graphics needs.

THOMSON INFORMATION SYSTEMS CORP.

Thomson 980W

Thomson Information Systems Corp. is a subsidiary of Thomson S.A., the French electronics conglomerate. It makes other peripheral devices, but its product line consists mostly of monitors and display adapters. The 980W, with the Advanced Graphics Controller, is Thomson's offering for the desktop publishing community.

The 20-inch display, combined with the Advanced Graphics Controller's 1,024-by-768-pixel resolution, sounds like just the ticket for high-resolution monochrome applications, but the lackluster performance of the monitor makes it hard to recommend.

The image on the big screen (which,



The Thomson 980W's cabinet is mostly steel, with a plastic front bezel holding the power, contrast, and brightness controls on the lower-right side.

exclusive of the bezel, measures 19 1/4 inches) is marred by fuzziness, not just in the corners, but along the entire outside of the display. It isn't enough to make the screen illegible, but it's not as clear as the other monitors reviewed here.

As the brightness level is increased, image quality deteriorates even further. At bright levels, the characters and background begin to smear together, reducing edge sharpness and contrast. The border also tends to go from black to gray.

Glare appeared to be about par for the group, meaning too high. A tilt/swivel base on the cabinet helps get around some of this. Physically, the 980W is quite large and heavy, not unexpected for a display of these proportions. The cabinet is largely steel, with a plastic front bezel holding power, contrast, and brightness controls on the lower-right side.

On a more positive note, the Thomson Advanced Graphics Controller (actually the product of Renaissance GRX) is probably the best of the bunch, both in terms of functionality and state-of-the-art construction techniques. Based on the Texas In-

struments 34010 graphics coprocessor, it excels where speed and the number of other graphics standards supported matter most.

The single, full-length board is constructed primarily of surface-mounted devices (SMDs), with components mounted on both sides. In spite of its high-density construction, the board ran surprisingly cool even after being powered up for over an hour. Only the five wire jumpers soldered to the underside seemed contrary to the otherwise excellent assembly quality.

To increase the performance capabilities on AT-type systems, the AGC fully exploits their 16-bit bus structure. The auto-switching circuitry allows the board to fall back to 8-bit bus operation for the older PC and XT designs as well.

The AGC can emulate more standard graphics modes than any other board tested here. CGA, MDA, and Hercules graphics adapter modes all appeared to function without a hitch, and an optional daughtercard (\$250) allows EGA emulation as well. All modes utilize the entire display area and result in a particularly legible dis-



FACT FILE

Thomson 980W

Thomson Information Systems Corp.
5731 W. Slauson Ave.
Culver City, CA 90230
(800) 325-0464

List Price: Monitor, \$1,095; controller, \$1,195.

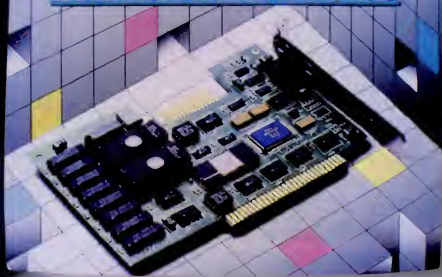
Requires: Full-length slot; DOS 2.1 or later.
In Short: Possibly the finest display adapter of the lot is throttled by mediocre monitor performance. The image is fuzzy along the edges, as well as in the corners, and image quality degrades noticeably at high brightness levels.

CIRCLE 66 ON READER SERVICE CARD

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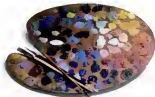
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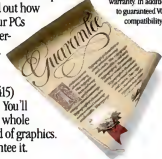
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■ PAPER-WHITE MONITORS

play for low-resolution applications.

Best of all, Thomson's AGC is not limited to monochrome use, but can, in fact, be connected to a color monitor such as an NEC MultiSync, providing 640 by 480 resolution in 64 colors. A conventional 9-pin connector is supplied for this purpose but not utilized by the 980W. Finally, the AGC has a port on the back for use with Microsoft's InPort mouse.

The 980W monitor is connected to the display adapter by two RF cables rather than the more customary single, 9-pin "D" connectors. This arrangement is just fine, but one of the cables was 5 feet long, while the other measured 6 feet in length. Curious.

The single software disk supplied with the board had a multilingual (English, French, Spanish, and Italian) setup program for copying files to a hard disk, as well as drivers for *Microsoft Windows* and *AutoCAD*, Version 2.60. Although the package advertised drivers for *1-2-3* and *Symphony*, they weren't present at press time. Instead, a sticker was enclosed that was meant to be placed on the warranty card. These drivers, it promises, will be mailed out at no cost as soon as they are available. They are slated to be ready by the time you read this.

The Thomson paper-white system, like just about everything else in this world, is a mixture of good and bad. In this instance, though, the good (the Advanced Graphics Controller) is overshadowed by the uninspired monitor.

◆ ◆ ◆ ◆ ◆ WYSE TECHNOLOGY

Wyse WY-700

The Wyse name will be familiar to just about anyone who has spent time around a mainframe computer system. The company manufactures more display terminals than anyone except IBM. It was a natural, then, for Wyse to go after the PC monitor market, and the WY-700 shoots for the desktop publishing crowd in particular.

Smaller than the other units reviewed here, the WY-700 seems almost dainty by comparison. The compact plastic case holds a picture tube listed as 15 inches (diagonally), but in reality it measures more like 13.5 inches. This small size is notice-



The Wyse WY-700 seems almost dainty compared with the others. The compact plastic case holds a picture tube listed as 15 inches (diagonally), but in reality it measures 13½ inches.

able when you're trying to view two pages full of 6-point type on the screen at once.

Regardless of its size, one area where the Wyse monitor has it over all of the other units considered here is its etched screen. Glare was absent in all but the very worst backlit environments.

The video display is interlaced, meaning that every other scan line is illuminated on alternating vertical refresh passes. This method of increasing resolution is less expensive than noninterlaced designs, but it can result in some flickering. On the WY-700, the interlace flicker is occasionally noticeable, but not enough to be really a bother. The flicker is much less apparent when the display is black-on-white rather than the reverse.

To help keep display flicker to a minimum, Wyse has equipped the WY-700 with a rather long-persistence phosphor. While it is intense white when the display area is illuminated, the afterglow is a dark green for about a half second. No problem—it just takes some getting used to.

The display adapter supplied with the WY-700 consists of a full-length board

with a similarly sized daughtercard riding piggyback. Both appeared nicely made, with none of the usual afterthought wire jumpers. The low component-packing density may account for the fact that the board was cool enough to handle even after being powered up for a couple of hours.

A Motorola 6845 CRT controller handles the graphics image processing, and it, along with most other components, is sol-



FACT FILE

Wyse WY-700

Wyse Technology
3571 N. First St.
San Jose, CA 95134
(408) 433-1000
List Price: \$999

Requires: Full-length slot; DOS 2.1 or later.

In Short: A compact monitor that more than makes up for its small screen by virtue of a (comparatively speaking) bargain price. CGA and MDA emulation make it suitable as a principal monitor for any system.

CIRCLE 187 ON READER SERVICE CARD



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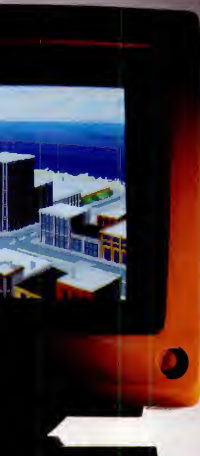
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CIRCLE 369 ON READER SERVICE CARD

■ PAPER-WHITE MONITORS

PC EDITOR'S CHOICE

• Taxan Crystal View

The choice here was particularly difficult. All of these monitors are a cut above the more conventional displays (CGA and so forth) when it comes to desktop publishing and CAD. At the same time, all have certain weaknesses—paucity of software drivers, absence of emulation modes, and others. Taxan's Crystal View stands out as the best all-around package. Its high-resolution mode display quality is bettered slightly by the Sigma LaserView, but its ability to handle more-conventional text and graphics requirements in a superior manner and its abundant features win out.

For those who don't want to cough up \$2,195 for the Crystal View, the \$999 Wyse WY-700 is hard to beat, and no apologies need be made for its commendable performance.

dered directly to the boards. Only the two ROM chips are socketed, presumably for future upgrades.

The monitor connects to the adapter via a 3-foot cable, much too short for mounting the PC anywhere but under the monitor. A power cord of a similar length plugs into the power outlet on the back of an IBM unit's power supply. Because many clones lack this feature, you may need a cord with a conventional three-prong connector. Both cables are merely annoyances, not major problems.

Software drivers shipped with the WY-700 include Microsoft Windows, GEM, I-2-3, and Symphony. Current versions of AutoCAD and Ventura Publisher also have drivers for the Wyse display, and some 60 other drivers (the products of third-party software publishers) are available from Wyse at extra cost.

Also on the disk are several utility programs aimed at getting the most out of the WY-700. SAVER is a memory-resident

program that blanks the screen after a user-definable period of inactivity. As with other programs of this type, pressing any key restores the video image. The FONT utility allows an alternate character set to be displayed in place of the default font, but only one may be used at a given time.

Because the DOS CLS command clears only the first 25 lines and 80 columns, another utility (appropriately named CLEAR) blanks the entire video display, regardless of which mode it's operating in. The last utility, SCREEN, is used with the DOS MODE command to select the display mode. You can select displays of 80 or 160 columns by 25 or 50 lines. Unfortunately, most other software for which device drivers are not provided, such as word processors, resets the display back to standard 80 by 25 mode on start-up. SCREEN occasionally causes problems with some software should you forget which display mode you're in. Running New England Software's *Graph-in-the-Box* was fine when MODE CO80 or SCREEN CO80 were selected first. Accidentally using SCREEN 80X25 instead filled the screen with garbage, but no damage was done.

The WY-700 has one major advantage over all of its competitors—price. Al-

■ One area where the Wyse monitor has it over all of the other units considered here is its etched screen. Glare was absent in all but the worst backlit environments.

though all of these paper-white systems are expensive, Wyse's offering, at \$999, is less than half the price of its nearest rival. At that kind of savings, the smaller screen becomes quite a bit more attractive. ☐

Frank Bican is a computer resources supervisor at a Cleveland medical center.

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CIRCLE 741 ON READER SERVICE CARD

THE TASKMASTERS: REAL 386 OPERATING ENVIRONMENTS

Although 80386-based PCs have been available for more than a year, their sole distinction in that period has been speed. None of the other, more important innovations incorporated into the design of the 80386 microprocessor—especially its advanced memory handling and its ability to run multiple DOS programs simultaneously—are put to use by most of today's applications.

In such circumstances, the \$1,000 price premium of 80386-based PCs sounds like a bad bargain, especially when you can now get 16-MHz 80286 chips. After all, the only real benefit anyone running DOS has ever gotten from an 80386 computer is

the quick 16-MHz tempo that it keeps.

Caught in dreamland are the promised 32-bit applications slated to jazz up the 80386, all conducted by a special 80386 version of OS/2, which remains unavailable and elusive as the missing chord—even in its first promised 80286 version. Current prognostications still put the arrival of OS/2 for the 80386 at more than a year off, and at that range, missing the target by a year or more is the rule rather than the exception in computer software.

The wait for OS/2 and 32-bit applications is not idle time, however. You can start the 80386 humming along on your favorite applications immediately. Though

you won't savor the full allegro of 32-bit microprocessing (unless you spend your spare time programming in assembly language), you can win the convenience of true multitasking operation at a 16-MHz, 16-bit beat. And unlike what you'd need to do under the great new operating system in the sky, you don't have to abandon your old standards. You can run all your favorite software with these new multitasking systems—you might even run it all at the same time.

Even now you're not limited to one choice: you've got three available today and three more on the horizon. On your dealer's shelf you'll find Concurrent DOS

Why wait for OS/2? You can have multitasking, multiuser computing right now with Concurrent DOS 386, DESQview, and PC MOS/386. And there are others just around the corner.

OPENING WINDOWS TO MULTITASKING

Microsoft Corp. plans to release *Windows/386*, a multitasking operating environment for computers equipped with the 80386 microprocessor, by the end of the year. Although *Windows/386* will have the same look and feel as *Windows 2.0*—including pull-down menus and mouse control—it will be endowed with additional abilities. For instance, *Windows/386* will make use of as much extended memory as is installed in its computer host and will multitask ordinary DOS programs as well as those applications written to the *Windows* interface.

Despite its powerful new features, *Windows/386* rates mostly as a graft job, however. A memory manager for the virtual 8086 mode of the 80386 microprocessor has been stitched onto ordinary *Windows 2.0*. The result would appear to be the best of both worlds, access and full compatibility with existing *Windows* applications coupled with the ability to run multiple DOS programs concurrently.

DOS gets the better of this pairing. *Windows/386* should give one of the best multitasking environments for DOS applications. Each executing program can be given access to the full addressable

range of DOS memory, 640K, less normal DOS overhead (about 50K). The memory required for administering the multitasking abilities of *Windows/386* does not impinge upon that available for DOS applications.

This DOS multitasking memory is drawn from the extended memory area. *Windows/386* cannot make use of the virtual memory or demand paging capabilities of the 80386, which simulates RAM using disk memory. Microsoft recommends at least 2 megabytes of RAM in the host computer to make use of DOS multitasking under *Windows/386*.

Applications running in the multitasking DOS environment of *Windows/386*, even so-called badly behaved programs that write directly to video memory, can be windowed on-screen. *Windows/386* simulates video memory and transfers bytes to real video memory as the displayed window calls for them. The *Windows/386* environment supports most modes of the EGA and VGA video standards (including CGA modes). Programs that use the few unsupported modes of these adapters can be run by yielding the full display screen over to them, but they cannot be windowed.

Compatibility with applications written for the *Windows* environment is not changed from that of *Windows 2.0*. These applications enjoy the same features—including the uniform graphic interface—and suffer the same limitations as in the older *Windows* environment. Note that these *Windows* applications do not have access to extended memory but can make use of EMS and EEMS.

Windows/386 is not related to OS/2 except that the two environments share the same graphic interface. Programs written expressly for the upcoming OS/2 operating system will not run under *Windows/386*. Of course, applications that run on *Windows/386* will execute in the real mode of OS/2, but so will almost all ordinary DOS programs. However, OS/2 cannot run more than one of these applications at a time.

Microsoft positions *Windows/386* as a tactical transition product, one that lets the owners of 80386 computers make better use of the power of their machines using an interface that's consistent with older versions of *Windows* and OS/2. In fact, it will make better use of the resources of the 80386 than will the initial release of OS/2.—Winn L. Rosch

386 from Digital Research, *DESQview* from Quarterdeck Office Systems, and PC MOS/386 from The Software Link. Promised but not reality at the time this was written are *Windows/386* from Microsoft Corp. (scheduled for release before the end of October), Microport UNIX System V.3/386 running DOS Merge 386, and Xenix from The Santa Cruz Operation—running VP/ix, a cooperative effort between Phoenix Technologies and Interactive Systems. Both DOS Merge 386 and VP/ix will allow execution of multiple DOS programs in a UNIX environment and are scheduled for release before year's end. All six are slightly different, but all are more than slightly appealing.

Four of these task managers rate as true operating systems, alternatives to the familiar (but not always welcome) DOS

prompt. Two are operating environments that work with DOS to multiply its abilities.

Divided another way, five do windows and one does walls. All do DOS applications, and all take advantage of a feature of the 80386 microprocessor that's too often overlooked by speed-crazed users wanting to put more mega in their hertz: virtual-8086 mode.

VIRTUAL PC Unlike the 80286 and all other previous Intel microprocessors, the 80386 was created with the full knowledge that PC DOS running on the ubiquitous 8088/8086 microprocessor was the most popular operating system ever written. Today PC DOS boasts a library of software larger than that of any other operating system in the world.

Intel's chip designers would have been foolish indeed to ignore compatibility with DOS when they developed the 80386. In an unusually enlightened approach, they went further than ever before in making the 80386 DOS compatible and backward compatible.




Their previous effort, the 80286, only tipped its hat to DOS by dividing its abilities between real mode and protected mode. While real mode was engineered to be backward compatible with previous Intel chips, which incidentally endowed the 80286 with DOS compatibility, regressing to real mode from protected mode essentially requires rebooting the system (one of the biggest hurdles that Microsoft's OS/2 engineers had to overcome).

This somewhat reluctant style of compatibility was a product of the 80286 de-



386 Multitasking Operating Systems: Summary of Features

(Products listed in ascending price order)

List price	 DESQview \$129.95	Concurrent DOS 386 \$395.00	 PC MOS 386 \$595.00
Type	Operating environment	Operating system	Operating system
Max. no. of users supported	1	3	25
Max. no. of tasks supported	Can load up to 255 and run as many as system allows	6	As many as memory allows
Windowing	●	●	●
Communication between tasks	●	●	●
File sharing between tasks	●	●	●
Password protection	●	●	●
 — Indicates Editor's Choice ● — Yes ○ — No			

sign environment. Work on the chip began before the bright future of DOS had become apparent and the huge program library existed. In fact, some former Intel workers claim that the 80286 was the chip Intel engineers really wanted to build back in the 1970s, when instead they had to corral their aspirations and develop the simpler 8086 and 8088. The basic 80286 design just may predate not only DOS but the brains behind it, too.

On the other hand, work on the 80386 progressed with the benefits of learning from such past transgressions and following the tremendous success of DOS. Consequently, instead of a casual greeting, the 80386 welcomes DOS with a full embrace and a goodly amount of bus(s)ing.

VIRTUAL-8086 MODE Besides its real and protected modes, the 80386 incorporates a new virtual-8086 mode that allows a single 80386 microprocessor to run multiple DOS sessions simultaneously, each of them completely isolated from the others. Where other chips have had to worry about programs trespassing on the territory used by other applications, the 80386 builds impenetrable walls around them. Even the worst-behaved software can be kept in check by virtual-8086 mode.

New multitasking software for the 80386 exploits the built-in ability of virtual-8086 mode. While the hardware ensures that one program will not pollute another, this software makes certain that

every application sees a pure PC environment, with all the interrupts, BIOS routines, memory, and hardware features at their appointed places.

Virtual-8086 mode does not solve all the problems of multitasking operating systems, however. Shared resources—the parts of a computer that all tasks need to use—can create collisions and crashes when several tasks attempt to access the same external resource at the same moment.

The obvious challenge to the system designer is the disk storage system. Access to disk drives must be orderly so that data doesn't get scrambled among the sectors of a disk.

Disk difficulties are similar to those faced by another preeminent multitasking problem, printing. Say, for instance, that you decide to rattle out your own abridgment of the *Oxford English Dictionary* using your word processor in one partition, then flip over to another partition and set 1-2-3 to grinding out a spreadsheet that analyzes the entire cash flow of the U.S. government. Both of these programs send their characters to the printer at the same time—and the printer, not knowing any better, just peeks out what it receives, not even bothering to ask what program it came from. The result will likely be gibberish, a combination of numbers and neologisms that would give a code expert conniptions.

These multitasking operating systems also face difficulties in dividing their time. Each application that is to be run by a microprocessor needs to use some of the chip's thinking time. Most multitasking systems divvy up these valuable moments by time slicing: assigning each task but a fraction of a second to carry out part of its job, then giving control to the next task in round-robin fashion.

The amount of time each task gets before the big switch varies from 1/60 second (Concurrent DOS 386) to around 1/4 second (DESQview). Moreover, time for each task need not be allocated evenly. Some of these systems allow you to decide how to make the split; others keep control to themselves.

SMOOTH OPERATORS The most important difference among these products is not how they work with software or hardware but how they work with you—and how you work with them. In general, they let you turn the PC's one-track mind into organized chaos. That is, these multitasking systems can help you and your computer think alike so that using your PC extends your mental processes instead of limiting them.

■ These multitasking systems can help you and your computer think alike so that using your PC extends your mental processes instead of limiting them.

Thus, when operating in top form, these systems disappear. You work with the same programs that you always have, but on your own terms. How close these multitasking systems come to that ideal, how well they work with your applications, and how they interact will determine

■ OS/2 ALTERNATIVES

which of them is your best choice.

The three operating systems are DOS substitutes. They do—or should do—everything for your programs that DOS does. They provide their own utilities for housekeeping and file management. They control your disk drives, your display system, and even how applications interact with your computer. In addition, these operating systems turn an ordinary PC into a multiuser workstation, handling up to 25 simultaneous users (in the case of PC MOS/386).

These three 80386 operating systems differ remarkably in how they do their jobs, however.

PC MOS/386 is a strict DOS surrogate. Patterned after PC DOS, it does everything that DOS does for your system and its soft-

■ When operating in top form, these systems disappear. You work with the same programs that you always have, but on your own terms.

ware. But it adds to its inherent DOS abilities by allowing concurrent execution of applications, and it offers several other features, such as print queuing, that are useful in a multitasking environment. On the other hand, in the interests of simplicity—both in installation and in the creation of the software itself—PC MOS/386 attempts no fancy display tricks such as windowing.

Concurrent DOS 386 does windows but flags somewhat in its DOS support. For instance, it does not supply any of the capabilities of the PC DOS command processor COMMAND.COM. However, it does support CP/M-86 applications besides those written for DOS. Software installation for DOS applications is somewhat more complex. Concurrent (as it's known to its friends) reads and writes disks made by or for either operating system in-

discriminately. In effect, it bridges the past (PC DOS) and the future (multitasking on the 80386) with the oddball (CP/M-86).

DOS Merge 386 under Microport UNIX and VP/ix under SCO Xenix come from a different direction. While PC MOS/386 and Concurrent were written primarily to take advantage of DOS applications (Digital Research had to do something to get on the DOS bandwagon before the parade passed it by), UNIX and Xenix have merely lashed out another tentacle to ensnare DOS. Merge 386 and VP/ix run DOS as a UNIX/Xenix subprocess: essentially an add-on, a curtsy to the sweet simplicity of DOS—and its multimillion users. Both allow multiple DOS applications to run on 80386-based PCs. With additional software, each can put multiple DOS windows on the screen of your computer. While the true 32-bit 80386-based power of your system is still reserved for only true UNIX/Xenix applications, that's another story—or rather, bookshelf full of volumes.

As a straight operating environment, *DESQview* might seem the least powerful of these multitasking systems, but its supposed weakness may be its greatest strength. Instead of replacing DOS, *DESQview* is a DOS enhancement that lets multiple programs shift in and out of memory and—on EEMS (enhanced expanded memory specification) equipped and 80386-based PCs—execute at the same time.

Because it runs under DOS, all the facilities of DOS are available to your programs when you use *DESQview*. Although its fancy screen handling requires some customization of your applications, *DESQview*'s own automatic installation procedure takes care of most of the details for most popular DOS programs. Compared with the operating systems, its major drawback is support for multiuser environments. By definition, that's something that a single-user personal computer really doesn't need.

Windows/386 makes the same promise but extends it with graphics ability and the support of DOS-architect Microsoft. *Windows*, however, lends greatest support to applications that are written to catch hold of its hooks. While it will give your favorite applications space to run on your

80386-based PC, its real power is tapped with only the few programs specially written to take advantage of the *Windows* interface.

Any one of these products can be an effective surrogate until OS/2 comes along. And who knows, maybe once you get one of these tunes in your head, you won't want to listen to the Siren song of some promised operating system anymore.

Concurrent DOS 386

In some ways, Concurrent DOS 386 is about as close as you can get to a steam-powered operating system. Certainly the 80386 chip is so powerful that even the bulkiest software won't huff and puff to get around, but Concurrent has a flair for bringing back yesterday. In this case, olden times are represented by CP/M, the aged operating system that first let small computers invade desktops across the country. The best that can be said for CP/M today is that it is quaint.

Understandably, Concurrent is fully backward compatible with the version of CP/M that ran on the 8088 series of microprocessors. The original version of that operating system is what gave Digital Research its start and sent it rumbling away on the roller coaster of success.

Concurrent combines CP/M and many of the features of PC DOS with a goodly dash of multitasking—enough to run four applications simultaneously on one PC and



FACT FILE



Concurrent DOS 386
Digital Research
Box DRI
Monterey, CA 93942
(408) 646-6464
Price: \$395
Requires: At least 640K
RAM; DOS 2.0 or later;

Compaq Deskpro 386 or compatible computer.

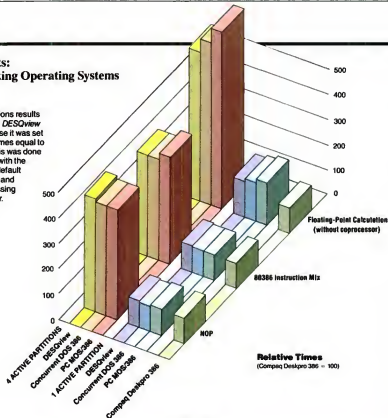
In Short: A multitasking operating system for 80386 computers that supports CP/M and most DOS applications in up to four windows and two external terminals, but will work better for most people as an operating environment under DOS.

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Benchmark Tests: 80386 Multitasking Operating Systems

Increasing the number of partitions results in a slowdown in performance. *DESQview* was penalized in this test because it was set up to allocate task processing times equal to those of the other packages. This was done to allow consistent comparison with the other programs. Running at its default .5-second foreground time slice and .167-second background-processing slice, *DESQview* would be faster.



Performance Times

(Times given in seconds)

	NOP	80386 Instruction Mix	Floating-Point Calculation (without coprocessor)
4 ACTIVE PARTITIONS			
DESQview	9.3	15.9	91.4
Concurrent DOS 386	9.0	16.0	99.0
PC MOS/386	9.0	17.0	110.5
1 ACTIVE PARTITION			
DESQview	2.1	4.2	22.5
Concurrent DOS 386	2.0	4.0	24.0
PC MOS/386	2.1	4.0	26.0
Compaq Deskpro 386	2.1	4.0	15.5

The **NOP** benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big 128K loop.

The **80386 Instruction Mix** benchmark test measures the time it takes to execute a selected series of processor-intensive tasks. The test program uses 80386 instruction code. These instructions are a subset of the total processor instruction set. The 80386 instruction mix implements a number of 32-bit operations. In the 80386 processor these become single instructions, whereas in the 8086 and 80286 versions of the benchmark test they remain multiple instructions.

The **Floating-Point Calculation** benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentiation, and logarithmic and trigonometric functions. The benchmark program uses the floating-point library included with Microsoft C Compiler 4.0.

UNIX GETS A BOOST FROM THE 386

Just as real men don't eat quiche (unless it's raw), real power users don't play with DOS. They show their savvy with a real operating system like UNIX or its work-alike Xenix, the two systems scheduled by mutual agreement to merge into one common standard next year. Unlike DOS, UNIX was not designed for dodos who barely fathom the power of the system prompt and, if they had their druthers, would be playing Space Invaders in a video arcade. From its very beginning UNIX was a multitier, multitasking tool for programmers who speak in mnemonics, acronyms, and formulas.

Originally created for minicomputers, UNIX worked its way up to mainframes and made stabs at the micro market. However, the system demands power from its host computer, power many PCs lacked. Now machines based on the

80386 microprocessor may be the best desktop engines for UNIX yet conceived.

For the last few years the goal of UNIX developers has been to make its arabesques of unpronounceable lowercase command names more tractable for untrained users while making the system more compatible with standard DOS applications. As a result of their efforts, you'll soon be able to run all your favorite programs as individual tasks under UNIX, all at the same time, without having to chain yourself to your PC for the next 2 years to learn the ins and outs of 10 megabytes of UNIX code.

Scheduled for release sometime in October is DOS Merge 386, Microport's proprietary refinement of Locus Systems' DOS environment for Microport's UNIX System V.3/386. By the end of the year, The Santa Cruz Operation promises its version of VP/ix, a cooperative development effort of Phoenix Technologies and Interactive Systems, to run DOS programs under Xenix 386. Both products are now being beta tested, and *PC Magazine* will take an in-depth look at both as soon as release versions become available.

Both environments will take advantage of the virtual-8086 mode of the 80386 microprocessors and allow PCs that use that chip to run multiple UNIX/Xenix and DOS applications si-

multaneously while supporting multiple external terminals (which can also run DOS sessions). Each DOS application running under either system will behave as though it had its own PC all to itself—including any standard display type up to EGA—and will execute faster than it would on an XT. Both systems will put the text output of even badly behaved programs on the terminal screens, so you won't require special serial I/O versions of your favorite applications to use them on remote terminals.

With additional windowing software that's currently available for both Microport UNIX and SCO Xenix, you'll be able to run concurrent DOS applications, each in its own window, on your desktop 80386 machine.

Of course, these new UNIX/Xenix multitasking opportunities would mean nothing if you had to spend a large frac-



FACT FILE

SCO Xenix/386

VP/ix

The Santa Cruz Operation Inc.
400 Encinal St.
P.O. Box 1900
Santa Cruz, CA 95061
(408) 425-7222

[Product not yet released]

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FACT FILE

DOS Merge 386

Microport UNIX System V.3/386

Microport Systems
10 Victor Sq.
Scotts Valley, CA 95066
(408) 438-8649

[Product not yet released]

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two more on attached terminals. That's six jobs at once. And that's more than enough to earn Concurrent the status of a true multitier, multitasking operating system, although one that's more modest in its capabilities than either UNIX or PC MOS/386.

Like *DESview*, Concurrent uses an operating-environment-style windows metaphor. Moreover, it's so compatible with PC DOS that it almost seems to execute like an operating environment rather than an operating system. If you wanted to, you could ignore many of Concurrent's abilities and use it as a mere operating environment. In fact, most DOS-oriented us-

ers (that means most people) will find that strategy the best way to exploit Concurrent's power.

Although Concurrent can run both CP/M and DOS applications, it does not provide full support to the DOS programs. For example, because Concurrent does not include the DOS command processor *COMMAND.COM*, programs that depend on it for some of their functions (or the features of those programs that depend on *COMMAND.COM* to function) will not work under Concurrent.

On the other hand, in some aspects the transition from ordinary DOS to Concur-

rent is smooth and easy. Concurrent can read and write both CP/M and PC DOS hard and floppy disks, so it will work with your hard disk without change. Concurrent will load from a DOS hard disk as if it were an operating environment; when installed, it even automatically stores itself in a standard DOS subdirectory.

Under Concurrent, CP/M is endowed with several facilities not shared by DOS. Among them are password protection of individual files by including the password after the command-line file references, and password protection of entire disks.

Concurrent has no built-in file-locking

tion of your lifetime learning UNIX to use them, so both manufacturers have designed their systems so that after installation you never need to think about UNIX again. Both will boot up and immediately give you access to multiple DOS sessions.

Even installation requires a minimum of UNIX understanding. For instance, SCO gives you a query-driven automatic system and a menu to make alterations to your system configuration. Microport requires but a rudimentary knowledge of UNIX to set the system up.

With either of these UNIX/Xenix systems you get a whole lot more than mere DOS multitasking. Both give you access to the full power of UNIX, even from the DOS prompt (and the familiarity of DOS from UNIX). Moreover, you and your applications will always have the complete UNIX command and file structure behind you. You can access UNIX/Xenix files from DOS and DOS files from UNIX/Xenix. You'll have the benefits of real record-locking, an integrated mail system, piping between applications, virtual memory, and a whole bookshelf full of documentation—some of which can actually be understood by human beings. You can use these systems as a gradual, foot-in-the-door approach to learning the intricacies of UNIX so you can gradually grow into true power-user status.—Winn L. Rosch

scheme of its own, however, and depends on individual applications to manage and secure files from simultaneous access by different tasks.

Communications between windows or tasks under Concurrent are quite limited. All users or windows can be allowed access to the same files, so data can be shared on a file level. If for some reason you have both CP/M-86 and PC DOS disks, Concurrent also offers you a bridge between the two. You can transfer files between them without a hitch, although programs written for one won't run under the other operating system.

In addition, information on the screen can be saved to disk using Concurrent's windowing setup commands. These, however, must be executed at the Concurrent prompt and cannot be used within applications. You could, however, run the command from a small on-screen window and capture a full screen of information, including that of other on-screen windows.

Concurrent is basically text oriented. It can run exactly one graphics application but only in the foreground, in a window that occupies the full monitor screen. You might expect more from a company that has developed the sometimes highly regarded GEM graphics environment. Graphics applications cannot be run on the multiuser terminals that you can plug into your Concurrent system, but that's also a limitation of the terminals.

Text-mode applications can run in smaller, overlapping windows. Concurrent even gives you two choices for setting up your preferred window arrangement: a menu-driven program, *Wmenu*, and a command-driven program, *Window*. These two window-control programs are used to scale, arrange, and set the colors used by the four Concurrent windows on the screen. The programs can be run in one window while the other three are in use, so you can get a pretty good idea of how things will look even from within other applications. Because the default configuration gives you only full screens, you'll want to familiarize yourself with these utilities.

DOS users will find the installation of Concurrent to be a breeze. Run the requisite program and Concurrent does everything for itself, creating the necessary subdirectory, copying the files from four distribution disks there, then adding an extra initial line to your AUTOEXEC.BAT file that gives you the opportunity to choose DOS or Concurrent every time you boot up. What's set up is, however, a Concurrent tabula rasa that you must customize to work the way you want it to.

NOT ALWAYS CONCURRENT Turning Concurrent into a reliable multitasking system after installation can be complex. For instance, when shipped, Concurrent is configured so that it doesn't operate programs concurrently. You've almost got to

read between the lines in the manual to discover what's going on and how to coax the most important feature from the operating system.

There's a good reason why Concurrent defaults to a lack of concurrency. Although written to take advantage of the virtual-8086 mode of the 80386 microprocessor, it does nothing to protect the screen between applications. An application that writes directly to video memory when executing in the background (for instance, *1-2-3* running a lengthy macro) will punch through the video of whatever application is in the foreground. Such results are usually not pleasing.

To initiate simultaneous execution of applications, you must run one or more initialization programs in each window be-

■ **DOS users will find installing Concurrent a breeze. Run the requisite program and Concurrent does everything for itself.**

fore you start each application. Although Digital Research helps matters somewhat by giving each window the equivalent of its own AUTOEXEC.BAT file, the documentation gives you little help in setting up the files that you need. From nearly every perspective, in fact, the documentation is inadequate.

In all fairness, it must be mentioned here that the Concurrent manual does include a listing of configuration programs for many more popular applications, but you're never given a good overview of how you should go about setting things up. While experienced users may be able to muddle through after a couple of abortive attempts, those who are new to desktop computers would be better off looking elsewhere.

After installation and setup, using Concurrent is both fast and easy. To switch ap-

■ OS/2 ALTERNATIVES

plications between the foreground and the background, you only need press Alt and the numeric keypad number that is associated with its task number.

Yet, the handling of the two supported terminals is inelegant. Concurrent requires applications programs to use serial I/O for proper operation. Although that requirement may not be arduous if you're writing your own software, it precludes the possibility of running most commercial applications on terminals.

Concurrent supports up to five printers, three parallel and two serial. The limit is enforced by the amount of power available to a standard PC. Thus, use of serial printers will rule out using the associated serial ports by terminals or modems.

Two printer-management programs are included with Concurrent, one menu driven (called *Printer Manager*) and one command driven. Both programs support manual print queuing. They do not intercept print commands sent by applications but send files directly to the associated printer for output.

To use this print-queuing system, you have to instruct your applications to print to files, then use the print-managing programs to arrange those files in the print queue. You do the thinking, not the computer or the operating system.

Concurrent includes several applications. Among these are *File Manager*, *Cardfile*, *DR Edix*, and a menu-building system.

File Manager is Concurrent's version of a DOS front end. It lets you carry out common system functions in a menu-driven format. Although it may appear to be, *File Manager* is not a control program for the multitasking aspects of Concurrent. *File Manager* merely runs as a task within the Concurrent environment and is invoked like any other program. It does pass control to other applications and resume control when the application unloads, but one copy of *File Manager* chains to only a single application.

Cardfile is a simple database-management system that implements an automated address book. Each record includes the following unalterable fields: last name, business, street address, city, state, ZIP code, telephone number, first name, and comments. *Cardfile* is essentially menu

driven, using a short horizontal moving-bar menu that allows you to select functions with the cursor keys. You can add, delete, update, print, and scroll through your records. Records may be printed individually or entirely to labels or plain paper if you choose.

The *DR Edix* text editor is designed to be a giant step ahead of the state-of-the-art EDLIN editor that's included with PC DOS. In many ways, *DR Edix* succeeds. It's screen oriented and offers an extensive array of commands and powers, including universal search and replace, and even lets you open two text-editing windows (in addition to and within the four Concurrent windows). But *DR Edix* is still command driven and hindered by a deficiency in documentation.

As yet another text editor in a very crowded field, *DR Edix* has little to recommend it as a standalone product, and it's hardly enough incentive to recommend Concurrent. It does, however, achieve its design goal and it is a giant step beyond the primitive editing support that is offered with DOS.

Concurrent may be used successfully to give an 80386-based PC multitasking abilities, but it's weighed down by CPM baggage that most DOS users will want little to do with. Although Concurrent makes a good operating environment, it more strongly hints that Digital Research might better direct its efforts to developing new products rather than keeping the old ones clinging to life on a respirator.

DESQview

As an operating environment rather than an operating system, *DESQview* is a tool that will unlock the capabilities of the 80386 microprocessor without stepping away from the DOS standard. Because it works with rather than in lieu of DOS, the transition to *DESQview* is relatively easy—you don't have to worry about reformatting your hard disk or about possible incompatibilities with your existing library of floppies. Almost every standard DOS application will run under *DESQview* without alteration.

Even though it's not an operating system, *DESQview* will bring to your 80386-based PC (and many lesser machines, too)



EDITOR'S
CHOICE

FACT FILE



DESQview
Quarterdeck Office
Systems
150 Pico Blvd.,
Santa Monica, CA
90405
(213) 392-9851
Price: \$129.95

Requires: At least 640K RAM; DOS 2.0 or later.

In Short: A single-user operating environment that gives easy, menu-driven control over multiple, concurrently executing applications in up to nine windows.

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true multitasking abilities. With *DESQview* you can load up to 255 applications at once, display up to nine windows on-screen at the same time, and keep several programs running continuously in the background. The limit on the number of concurrently executing programs is defined by system memory. The number of loaded programs—or windows—is limited only by disk capacity.

Information can be readily exchanged between windows through an elaborate cut-and-paste system that lifts the information from the screen displayed by one window and types it into another window, even reformatting the data along the way. Included with *DESQview* is an auto-dialer that uses this cut-and-paste facility to place telephone calls through Hayes-compatible modems. An advanced form of information transfer, in which the underlying data structure can also be moved, is available to applications that are written particularly for *DESQview*.

The only feature of a multitasking operating system that *DESQview* lacks is multi-user capability. *DESQview* is designed as a single-user, single-computer system. It's an individual productivity tool that can make your life with your 80386-based PC a lot easier.

Once *DESQview* is installed on your computer—a task that's characterized by its simplicity—the only time that you have to deal directly with DOS is to load *DESQview* into memory. If even this one glance at the DOS prompt is too much for you,

■ ■ ■ ■ ■ ■ ■ ■ ■ ■

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ware. AST Premium/386 operates with your current multifunction and data communications cards, as well as newer, more powerful board-level peripherals designed for AST's Multimaster Bus. The savings add up when you consider all of the existing software programs, enhancement boards, drives, monitors and keyboards you already own.

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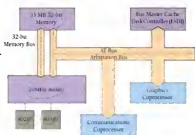
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AST Premium/386 Architecture



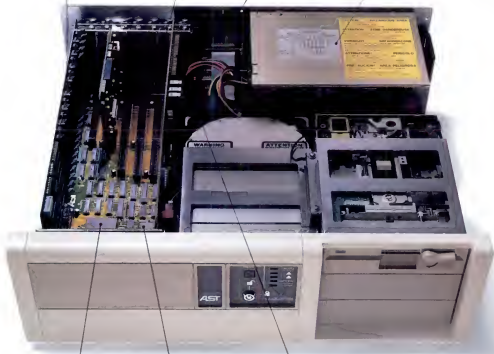
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Expandable to	13 MB	13 MB	4 MB
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Expansion Slots	7*	7**	2
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■ OS/2 ALTERNATIVES



Performance Tests: 80386 Multitasking Operating Systems

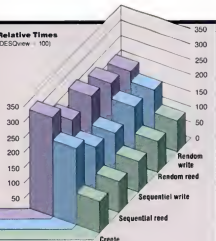
As the times here show, *DESQview* is by far the most compassionate environment for the LAN performance tests. It was, in fact, the only environment that would successfully run a database simulation. This performance test produced read errors and corrupted data files under both PC MOS 386 and Concurrent DOS 386. Because of this, no results are given for the database simulation test.

Performance Times
(Times given in seconds)

	Hard Disk Access Load				
	Create	Sequential read	Sequential write	Random read	Random write
PC MOS 386	70.0	49.0	59.0	56.0	62.0
Concurrent DOS 386	54.0	37.0	38.0	44.0	52.0
DESQview	22.0	20.0	23.0	24.0	30.0

The **Hard Disk Access Load** test heavily loads the hard disk and disk-caching system. To do this, each partition randomly accesses its own 1-megabyte data file using 4K-byte records. Data written to the file is changed each time. The random reads typically access data outside the cache, which forces a disk read, as does any write.

Relative Times
(*DESQview* = 100)



you can load *DESQview* through your system's AUTOEXEC.BAT file. After you do that, just boot up and you'll be in *DESQview*.

Because *DESQview* is text-based rather than running in graphics mode, it's quick. Despite its text base, however, *DESQview* understands and works with several (but not all) graphics display modes. Programs that use unsupported modes will work with *DESQview* but are not compatible with its windowing system.

To control *DESQview* you can employ a mouse, cursor keys, or alphabet keys for command choices. Unlike many mouse-controlled programs, *DESQview* accepts that the world has not been won over to rodent technology and makes keyboard command as easy and helpful as using the mouse. In any case, once you've entered the *DESQview* system, you're about three or four keystrokes away from any application within the system's repository.

The first keystroke, nominally the Alt key by itself, pops the *DESQview* menu on the screen. Another selects a function—open a window, switch windows, close a window, and so on—and two more strokes (or a swish of your mouse) select an application to run from the list of programs you've installed, as well as many DOS functions.

In lieu of its own programming language or batch file system, *DESQview* uses a script system to load and run applications in its multiple windows automatically. Through the script system—essentially easy-to-make keyboard macros—*DESQview* memorizes sequences of

■ *DESQview* accepts that the world has not been won over to rodent technology and makes keyboard commands as easy and helpful as using the mouse.

your keystrokes and plays them back whenever you want as if they were typed afresh at the keyboard.

A valuable twist to this macro ability causes one appointed script (which you define) to execute automatically when *DESQview* is started and when each of its

windows is opened. Of course, each window gets its own dedicated start-up scripts. These scripts can automatically set up your *DESQview* system, open all the windows that you normally use in a session, start programs running in each window, and even run each application through a normal, everyday routine.

As with all the windowing systems, *DESQview* is designed to let you flip quickly between applications, each sequestered in its own window of one of three distinct types. Two are small, occupying less than a full screen, and are divided into foreground and background windows. The third, a full-screen window, is always in the foreground.

The difference between foreground and background windows is visually apparent. A small foreground window always has a double-line border around it, and it overlaps the top of background windows. A small background window has a single-line border. A full-screen window has no border at all.

The operational difference between foreground and background windows is that only one foreground window is allowed at a time. Only that one foreground window will accept keystrokes from the keyboard. In properly configured 80386-based systems, background windows con-

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■ OS/2 ALTERNATIVES

time to execute—at least until they require direct keyboard input. *DESQview*'s script system can substitute for ordinary keyboard input and keep such applications running in the background. In addition, communications programs can interact with remote devices even when operating in the background.

In improperly configured 80386-based systems, non-80386 systems without the necessary additional hardware (an EEMS board), and 80386 systems that have inadequate memory, or with badly behaved applications, software in background windows will be put on hold.

WINDOW CUTTER *DESQview* is, however, fully capable of slicing the text images in any window in any system—even ill-natured full-screen-only programs—down to size for observation purposes. For instance, you can cut a window out of the display of an incompatible worksheet to view it within another application. You cannot do any work on their pint-sized pieces of ornery applications, however. *DESQview* will cut off your keystrokes before they get far enough to cause any problems.

As with most operating environments, *DESQview* is memory resident. Once loaded, it lurks in your computer's memory even while other applications are running. While that makes *DESQview* quick to react to your commands, it also means that a portion of your system's memory must always be devoted to *DESQview*. That amount of memory is sliced away from the 640K bytes that would normally be available to programs under DOS. It's one reason why only 605K bytes (or less, depending on your system configuration) of RAM can be dedicated to each window running on an 80386-based PC.

The *DESQview* engineers have attempted to optimize the memory usage of the environment. One way they've shaved the RAM it requires is by putting some program code (about 65K bytes) in the extended memory area.

One of the chief problems faced by any multitasking system that attempts to load several programs into memory at once is that standard PC DOS systems rather quickly run out of RAM, what with their 640K-byte limit and the growing number

of applications that want to horde the whole supply for themselves. *DESQview* offers two solutions to the problem by supporting both virtual memory and EEMS.

Virtual memory systems use space on a disk drive to simulate additional system RAM. Program code is shifted to and from disk as it is needed in the execution of the application.

DESQview does not use a true virtual memory system, however. It merely unloads an entire application from system RAM and puts it on disk to make room for the next application. While a true virtual memory system lets applications execute

■ *DESQview* does not split its time evenly between applications but divides itself between foreground and background tasks in a time ratio of your choice.

even though they are being shifted to disk, for performance reasons (essentially to eliminate thrashing) *DESQview* brings programs that use virtual memory to a halt. Hard disks, RAMdisks, and floppy disks may be used for virtual memory under *DESQview*, but using floppies is ill-advised for performance reasons.

To enable concurrent operation on 80386-based systems, Quarterdeck supplies a special driver that turns the extended memory of an 80386-based PC into EEMS, appropriately called the Quarterdeck Expanded Memory Manager or QEMM. This driver controls the virtual-8086 mode of the 80386 microprocessor and assigns one virtual PC to every window in the environment. Each program can use up to 605K bytes of RAM, should your 80386-based PC be equipped with sufficient extended memory.

When programs are running concurrently, *DESQview* operates as a time-slic-

ing multitasking system. It does not split its time evenly between applications, however, but divides itself between foreground and background tasks in a time ratio of your choice. As a default, it will devote five clock ticks (that's five times $1/18$ second) to foreground tasks and three ticks to each task in the background.

You can alter this ratio by using the Advanced option to *DESQview*'s setup procedure. The number of ticks you assign to foreground and background applications alters in two ways how your system reacts. The ratio between the two kinds of applications affects what percentage of its time your PC devotes to each; the absolute number changes how often it switches. To avoid thrashing, you won't want it to switch too often. To avoid bringing either background or foreground processing to a halt, you'll want to avoid lopsided ratios. In other words, you won't want to venture too far from the default 5:3 choice unless you have your own aberrant agenda.

DESQview allows the use of multiple printers, and different windows can output to different printers concurrently. However, multiple simultaneous print jobs sent to the same printer may result in collisions and strange things appearing on paper. Although you and not *DESQview* must manage print chores, this deficiency is not devastating in a single-user system.

DESQview was a successful program even before hardware was available to make it useful as a multitasking windowing system. The key reason is that *DESQview* can make any computer easier to use. Instead of enigmatic DOS prompts—the C> prompt is the electronic equivalent of a blank stare—*DESQview* offers completely menu-driven and prompted control over all aspects of a PC's operation.

Even if you were somehow shortchanged on deductive logic as you struggled through school, you'll be able to figure out the almost entirely intuitive command structure of *DESQview*. Strange as it may seem, running multiple tasks with *DESQview* is ultimately easier than wrestling with one application armed with nothing but DOS. That simplicity of operation and multitasking power make *DESQview* an excellent choice for all but those who need to string several terminals on the end of one multiuser 80386-based PC.



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PC MOS/386

MOS stands for Modular Operating System. Although that lifts PC MOS/386 onto the same pedestal as the similar-sounding PC DOS and MS-DOS, the familiar initials do offer a hint at the greatest strength of this clever operating system. PC MOS/386 is a bridge between PC DOS and the 80386 microprocessor. No mere wooden trestle, it's a full-fledged suspension bridge, one capable of transporting the heaviest loads into new territory.

PC MOS/386 couples the familiarity of PC DOS commands and functions with extensions into the land of multitasking and multiuser applications. At the bottom of the list of its capabilities is the one that individual users are most eager for: concurrent operation of existing PC DOS applications.

PC MOS/386 builds upon that foundation with the ability to execute programs written in the native mode of the 80386 microprocessor using 32-bit instructions. Extensions of the basic system allow up to 25 simultaneous users, complete with security features such as record locking and password protection.

If you're already running DOS on your 80386-based PC, you can make the transition to PC MOS/386 in less than 5 minutes. You don't even have to reformat your hard disk. For the most part, you'll still be using the same familiar command names—such as DIR, COPY, DEL, and FORMAT—and you won't even have to bother redesigning your system's AUTOEXEC

.BAT and CONFIG.SYS files, at least to get started. All the other software drivers that you use, all the memory-resident applications, will take to their new home instantly. Because both the floppy- and hard-disk data structures are the same for PC MOS/386 and DOS, you can exchange program or data files with the easy familiarity of exchanging floppy disks.

Some changes will be evident—for instance, the system's begging you to answer its plaintive question "What?" instead of leering at you for your "Bad command or file name." And you'll probably fall in love with your computer again as you press a couple of keys and pop between applications.

The "Modular" in the name of PC MOS/386 refers to the way in which it was written, linked together from several modules. Although the idiosyncrasies of construction usually awe only other operating system creators, the modular nature of PC MOS/386 holds important benefits for the humble user, too. Modularity means that the system can be easily updated and adapted by adding or substituting new modules.

The most important of these graftable changes comes when you want to expand your system beyond single-user status. A simple module swap stretches the base system, which handles no more than one PC, into a true five-station multiuser system. You can add dumb terminals to let your associates, aides, cohorts, and coconspirators share your favorite programs and databases.

Should your circle of friends suddenly widen, you can expand your system to 25 users by sliding in another new module. The practical number of simultaneous users is limited, of course, by the processing power of the single 80386 microprocessor that's the main brain of the system. It all depends on your tolerance for delay, but 25 users, all scrambling for a few milliseconds of processing time, can leave you drumming your fingers for hours on end.

As with PC DOS, the PC MOS/386 package includes a variety of useful utilities, including a disk-caching program and a RAMdisk. The only software it lacks is a BASIC interpreter.

The extensions that PC MOS/386 adds to PC DOS are another advantage—for ex-

ample, support for larger hard disk volumes (with some sacrifice of compatibility with a few PC DOS programs) up to 256 megabytes. As with PC DOS, PC MOS/386 also supports multiple partitions on a single hard disk including multiple hard disk partitions running under the same operating system, a feature of only the latest 3.30 version of PC DOS. In addition, PC MOS/386 allows you to boot from any of the hard disk partitions with little fuss or bother.

For systems that will be used solely by a single person, the most exciting aspect of PC MOS/386 is its true multitasking ability.

■ By not using virtual memory, PC MOS/386 is simpler—which means there's less to go wrong.

ties. The design of the operating system itself imposes no limit on the number of simultaneous activities that it can execute (as opposed to the number of users or terminals that can be connected). The practical limit, however, depends on memory and your own patience.

PARTITIONS PC MOS/386 instantly shifts between tasks by keeping all programs and data in memory and assigning each a piece of memory called a partition. You won't have to wait while sections of code are shifted from RAM to disk and back again when the system shifts between partitions. However, because PC MOS/386 slights the virtual memory capabilities of the 80386 microprocessor, running multiple applications can require substantial memory. Just to get started, you'll want 1.5 megabytes or more.

Of course, by not using virtual memory, PC MOS/386 is simpler—which means there's less to go wrong. You don't have to reserve huge amounts of your hard disk to be used for accommodating errant sections of code.

Each partition requires at least as much system memory as the application that runs



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PC MOS/386

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128K RAM.

In Short: An true multiuser, multitasking operating system that features DOS-like commands and a structure that makes it easy to learn. Modular in design, the single-user system can be upgraded to 5 or 25 users with additional modules.

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Wren IV	307	16.5	SCSI	10-15
Wren III	182	16.5	ESDI	10
Wren III	160	16.5	SCSI	10
Wren III H.H.	166	18	ESDI	10
Wren III H.H.	91	18	SCSI	10
Wren II	96	28	ST506, ESDI	5
Wren II H.H.	51	28	ST506	5

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SCSI models list usable capacity formatted in 1024 Byte sectors.

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■ OS/2 ALTERNATIVES

inside it. The memory is assigned to the partition and not to an application. The partition operates as a separate environment that provides a program with the facilities it needs to run, including memory and interrupt service. As a consequence, the memory assigned to a partition is reserved for it even when the program running in that partition is put on hold, stops executing, or is unloaded from the partition's memory.

PC MOS/386 allows assigning a partition any amount of memory from 32K bytes to about 640K bytes. In all but the first partition, this memory is drawn from the extended memory area of the 80386 microprocessor.

Once a partition has been set up, it can be brought into the foreground with a "hot-key" combination. You simply hold down the Alt key, then type in the task identification number using your computer's separate numeric keypad. When you release Alt after you've typed in the partition number, PC MOS/386 will snap the designated partition into the foreground.

Just as PC DOS runs its special AUTOEXEC.BAT file whenever you start up your computer, PC MOS/386 also makes provisions for automatically executing a batch of commands. PC MOS/386 allows you to define a similar batch file for each partition.

Although PC MOS/386 is a time-slicing system, it accommodates more important tasks by including innate abilities to prioritize the applications that it runs. PC MOS/386 supports the most elaborate priority hierarchies with up to eight levels. Your most important program can be given all the processor time that it needs, releasing control of the 80386 only after it has finished.

PC MOS/386 handles one of the more trying problems of single-user multitasking—application windowing—by simply ignoring it. The operating system makes no pretense of letting you view what more than one application is doing. Each task is given full screen control when it is switched into the foreground. As soon as it is switched into the background, it loses screen access but keeps executing. PC MOS/386 keeps track of every screen change made by the application, and when a given program is allowed back into your

PC EDITOR'S CHOICE

- DESQview
- PC MOS/386

DESQview wins top honors by giving you the most 80386 power while requiring the minimum of work on your part. Because it runs under DOS and gives you menu (and mouse, if you like) control of your applications, it's the easiest way to get true multitasking on your 80386-equipped computer. After a few minutes of installation, you'll be popping between applications almost instantly and intuitively.

If you need multiuser capability, however, PC MOS/386 is currently your top choice. Despite its ability to run an almost unlimited number of applications simultaneously and serve up to 25 users, it's still enough like PC DOS so you won't have to relearn everything you know about your computer. It installs easily and still allows you to revert to PC DOS if all this multi-everything is too much for you.

consciousness in the foreground, the view you get is of the current screen status of the application.

Keyboard control follows screen access. Whatever typing you do at the host computer affects only the task that is in the foreground. Tasks can receive your keystrokes only when you can see them.

PC MOS/386 approaches other problems—such as contests for control of system interrupts and inelegantly written programs that try to steal all of the host microprocessor's time merely to scan the keyboard—by giving you direct manual control over how such functions are assigned. For instance, certain interrupts—special system commands that demand the immediate attention of the microprocessor, can be reserved for certain tasks to prevent confusion while others can be shared by all. The choice is yours.

PC MOS/386 solves the shared-printer problem with minicomputer-style queuing. The operating system imposes itself between each application and your printer. As soon as one application starts printing, it blocks any other program from using the printer until the first one finishes. All the applications that want to use the printer thus have to stand in line—that is, in the queue—and their output is handled on a prioritized first-come, first-printed basis. To conserve memory, PC MOS/386 uses disk memory rather than RAM to spool the data that's awaiting printing.

For PC MOS/386, multiuser operation is merely an extrapolation of its multitasking. Additional users are assigned their own partitions. Keyboard input and video output are redirected to these users and their dumb terminals through serial ports in the host computer.

Multiuser operation does not preclude multitasking on the host computer. Partitions can be assigned to users or host tasks indiscriminately. Again, the practical limit is how finely you want to split the processing power of the host system's 80386 microprocessor.

The shortcoming of PC MOS/386 is that it's not published by IBM or Microsoft but by a small company in Atlanta called The Software Link. Although PC MOS/386 is indeed useful and may be discovered by the rest of the world, it lacks the backing of IBM to reassure users that it has a chance of becoming a standard. Then again, some software companies, like Microsoft and Lotus, have grown into multi-million-dollar institutions in but a few years. PC MOS/386 may launch the next software publishing rocket.

In truth, the name-recognition problem of PC MOS/386 doesn't mean too much. PC MOS/386 gives you a two-way street to progress. If it just doesn't work out, you'll be able to move back to where you began—back to DOS—relatively painlessly.

PC MOS/386 is more powerful than Concurrent, more familiar than UNIX, and more complex than DESQview. For anyone who must combine multiuser and DOS abilities, it ranks as a top choice. ■

Winn L. Rosch is a contributing editor of PC Magazine.

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Coping with Copy Protection

Hardware and software—the Copy II PC Option Board and Copy II PC software, CopyWrite, Disk Mechanic, HardRunner, and UNlock MasterKey—help you avoid the hassle.

Copy protection is not what it used to be—an irritating guard against copying that many companies applied to their programs. Today only a few continue to use copy-protection schemes to guard against piracy. Many others have dropped copy-protection schemes from their business software programs. But copy protection remains one of the hottest issues in the personal computer industry—largely because the largest selling program, 1-2-3, remains copy protected.

On one side of the issue stand software manufacturers that have invested considerable time and resources in developing their

products and that see copy protection as a means of protecting their programs against piracy. On the other side are the consumers, who very often are not pirates at all but are people who have invested hundreds of dollars in the product. These consumers want to be able to make backup copies to protect their investments, to transfer the program to a 3½-inch disk for use on their laptop, or to install it on their hard disk at home so that they don't have to cart around program disks if they take work home at night. Although companies often insert shrink-wrap warnings that one program should be purchased for one computer,

many of us believe we should be able to use software as we do a book. Only one person can read it (in this case, use it) at a time, but that person ought to be able to pass it around.

A small industry has developed out of this dilemma; several new firms have begun manufacturing products that allow you to back up your program disks and run those programs without the interference of keydisks or system disks. Central Point Software, TranSec Systems, Quaid Software, MLI Microsystems, and Nostradamus have developed software and hardware that defeat copy protection.

■ COPY PROTECTION

DISMISSAL THREATS Although items that break copy-protection schemes are often viewed as outlaw products by software vendors, these programs do not break copyright laws. They give consumers the legal ability to make archival copies of software. But while they don't run afoul of the law, they may run afoul of company policies. Most large companies have adopted strict rules that forbid employees to copy software or use illegally copied software. In some cases, the policies call for immediate dismissal of employees who are caught with illegal copies.

Among major business software manufacturers, only Lotus Development Corp., IBM Corp. (in its Assistant series), and Paperback Software (in its VP series) still copy-protect software. Paperback Software, however, will provide nonprotected versions of its products for an additional \$10. But there are still hundreds of thousands of software packages in use that were produced before copy protection was dropped from the business packages.

Although copy protection was not invented with the IBM Personal Computer, its story really begins when the machine was widely embraced for business use. As soon as the PC started to penetrate the corporate world, software companies became avid users of copy protection. They rationalized their behavior by pointing to how easy it was to copy software—a mentality that presumed guilt with ownership. That thinking was not unique to the software industry. Legal questions dominate the use of cassette players and VCRs in the music and video industries. Vendors fear they will lose sales to illegally copied duplicates of their wares.

The extent to which piracy occurs has never been proven. But in a rigorous investigation in the late 1970s, the Association of Data Processing Services Organization released results of a study indicating that half the users of *WordStar* were using illegal copies. Manufacturers cited the study as an endorsement of their need to copy-protect. ADAPSO tried to encourage software manufacturers to consider using a hardware protection device, called a key, which was plugged into the serial or parallel port of the computer but which didn't affect the use of the port. This was costly and didn't seem to impress manufacturers.

An industry survey revealed only about 5 percent of the respondents liked the idea; ADAPSO dropped it.

ELIMINATING PROTECTION The first programs designed to defeat copy protection were written for Apple II software. In the spring of 1981, a package called *Locksmith*, from Omega Microwave, came

■ Although the legal questions are more or less settled, the moral questions about the use of copy protection persist.

to market. The product is no longer sold, and the company has gone out of business. The second, which appeared just a few weeks later, was *Copy II Plus*, the first of a series of successful packages from Central Point Software. Central Point released its most well-known package, *Copy II PC*, in 1982.

Manufacturers initially responded with horror to the copy-protection liberators. Central Point Software was driven out of the Software Publishers Association, and the *Wall Street Journal* wrote a feature story on its president, Michael Brown, calling him "a hero to some, a villain to others." *PC Magazine* was one of those that called him a hero. Brown was honored for special service to the industry in *PC Magazine*'s second annual Technical Excellence Awards at Spring Comdex in May 1986.

There were also questions about the legality of programs that broke copy protection or allowed consumers to bypass it. Were companies such as Central Point in collusion with customers to break copyright laws? The legal question was essentially settled in 1984 with a case that involved the sale of VCRs—Sony's Betamax, to be specific. As part of its decision in *Sony v. Universal City Studios*, the Supreme Court considered the issue of a product contributing to copyright infringement. The Court ruled that as long as a

product had a substantial noninfringing use, there was no contributory effect. The Court also ruled that since copy-protection liberators give consumers the right to make archival copies, which they are entitled to do under section 117 of the copyright law, the programs do have a substantial noninfringing use.

Although the legal questions are more or less settled, the moral questions about the use of copy protection—and the software that liberates other programs from it—persist. Users who want the right to keep their systems up and running by making as many backup copies of software as they need become more insistent about 2 years ago when hard disks became prevalent. Users just don't want to deal with the inconvenience of keydisks.

LOSING SOFTWARE Even if copy-protected software could be installed on a hard disk, consumers risked losing the first of two copies of their program to a hard disk crash, something that was (and continues to be) likely to happen. If the program was lost a second time, at best the user could wrangle with the manufacturer and hope to get a replacement. But even if they were successful, it meant downtime for their critical business applications—a nightmarish prospect for large corporations, and especially for those responsible for keeping the PCs up and running. Those users who had come from mainframe environments were accustomed to making as many copies of programs as they wanted as part of disaster recovery strategies. Their outcry was joined by groups, such as the Capitol PC Users Group, and consumer magazines like this one, which argued that users should not have to worry about losing their software because of protection schemes.

Borland International was one of the first companies to drop copy protection when it issued a nonprotected version of its popular *SideKick*. Borland offered both a copy-protected version and, for \$30 more, a nonprotected version. Today Borland offers only the \$84.95 nonprotected version. The tremendous appeal of the nonprotected version caught the eye of other manufacturers, and they followed suit. Ashton-Tate released *dBASE II* without copy protection, but then added it to *dBASE III*

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■ COPY PROTECTION

when it was released in 1985. The publisher removed the copy protection again about 18 months ago when it released *dBASE III Plus*. Today most business programs from major and second-tier software manufacturers are not copy-protected. Copy protection could be found on early versions of *Microsoft Word* and the *PFS:* series from Software Publishing Corp., for instance, but not anymore.

THE LOTUS HOLDOUT The best-known holdout is Lotus Development Corp. And even Lotus has adjusted its policy and begun removing copy protection from its products. Lotus dropped copy protection from *Symphony* in Release 2.0, which came to the market in September. Industry sources predict that Release 3.0 of *1-2-3*, due out in 1988, will not be copy protected.

Lotus began relaxing its position on copy protection in August 1986, when it

formalized its marketing relationship with large corporate customers and offered to remove copy protection on *1-2-3* and *Symphony* for them if they had a formal anticopying policy.

Lotus has also released a number of packages in the past year without copy protection—*HAL*, *Freelance Plus*, *Metro*, *Lotus Express*, *Manuscript*, and *Measure*. It also dropped copy protection from *1-2-3 Report Writer*. Until recently, Lotus said it would consider lifting copy protection only when it was convinced that copy protection was no longer necessary. It said that would happen when almost all businesses have copyright protection policies in place. Industry analysts estimate about two-thirds of the Fortune 2,000 have copyright protection policies.

The arrival of OS/2 and the penetration of IBM's new Personal System/2 could also change the future of copy protection. OS/2 will require different kinds of copy-

protection schemes than those that exist today. The defenders of copy protection might find this a good time to drop the schemes from their software.

But there is clear evidence that protection schemes will continue to be used by the vendors of vertical market software, such as accounting programs, and the producers of educational and game software. In these markets, there is no powerful medium for a collective outcry as there was in the business area. Nor can customers as easily demonstrate an effort to curb making illegal copies.

HOW IT WORKS Copy-protection schemes have varied considerably over the years. But most of them use what is called a signature—special marks or oddly sized sectors on the disk, and a checker or routine that looks for the signatures.

One of the early favorites was PROlok, produced by the Vault Corp. In this

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Computers and Communications

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scheme, a hole, or group of holes, was burned onto a disk in precise locations. Then the checker would try to read that portion of the disk and come back with an error message. If this didn't happen, the program knew the disk wasn't an original and it would cease to work. Complaints about PROlok provoked one of Vault's largest customers, Ashton-Tate, to drop it from domestic software (it is still used on foreign versions). Ashton-Tate's move led to a rapid decline in Vault's fortunes, and the company eventually filed for Chapter 11 protection. The company still exists and has been pursuing a lawsuit against Quaid Software, producers of *CopyWrite*, a package that circumvents PROlok and other copy-protection schemes (see *CopyWrite* review).

But PROlok is hardly ever used any more. It is so rare, in fact, that Central Point Software, maker of *Copy II PC*, no longer updates its PROlok liberating rou-

tine. When PROlok was popular, the copy-protection liberators devised methods of fooling the checker. They would monitor the operation of a program to catch the checker in its act of inspection. Then, before it could tell the program there was no hole, the memory-resident copy-protection-busting software would issue the same electronic status codes that would be issued if there were a hole. The program was satisfied, and so was the user who had a functioning backup.

SUPERlok took PROlok's place as the favorite protection scheme. It also uses a signature, but not a physical one. SUPERlok writes data to locations on a disk where the floppy disk controller doesn't typically expect to see data—the gaps between sectors. A disk is made up of tracks like a record. There are 40 tracks on each side of a floppy, and the read/write head of the drive is operated by a step motor that reaches these tracks. Each track is made up of nine

sectors of 512 bytes of data each. Between these sectors are gaps that separate the sector fields. The gaps are approximately 80 bytes long. Some of SUPERlok's schemes write data to these gaps. The normal IBM-type floppy disk controller can't write to the gaps, so if the copy-protection checker looks at a gap for data and doesn't find it, it knows the disk is a phony.

Other signatures used by SUPERlok include overlapping sectors or sectors of unusual size. None of these schemes can be duplicated by the standard floppy disk controller. All the controller can do is see that they are on the disk. SUPERlok also encrypts the main executable system file and hides it behind a loading file. The loader file, typically one with a .COM extension, will not decrypt the system file and run it unless it finds the signatures it expects.

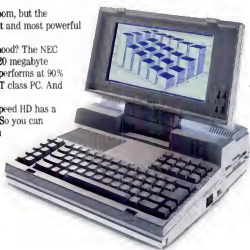
To defeat SUPERlok schemes, the copy-protection breakers use an approach developed by TranSec Systems, maker of

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CIRCLE 207 ON READER SERVICE CARD

■ COPY PROTECTION

the *UNlock MasterKey* program. It runs the original program until the checker verifies the signature and loads the hidden system file into the computer's memory. It then takes a snapshot of the file in memory and dumps this back to a disk. The executable system file now sits on the backup disk in its unprotected form and the loader file—which also carries the checker—can be eliminated.

But even though any copy-protection scheme can be broken, there are endless variations on the theme. Copy protection can be changed often enough to keep all of the copy-protection breakers at bay. The only reason this doesn't happen is that companies put their programs through complex quality-assurance cycles, and it is quite costly for them to change the scheme very often.

Copy II PC

Copy II PC may be the most familiar name in the world of copy-protection breakers. Its various versions (which include *Copy II Plus* for the Apple, *Copy II Mac* for the Macintosh, and so on) have sold over 400,000 copies. The bulk of those sales are for *Copy II PC*. It is perhaps the simplest of its type to use, and it will work with most of the software that is still protected by SUPERlok, PROlok, and other similar schemes.

The program's simplicity is reflected in its manual. It is just 11 pages long, and the last 2 pages are descriptions of other products that are offered by Central Point Software.



FACT FILE

Copy II PC
Central Point Software Inc.
9700 SW Capitol Hwy.
Portland, OR 97219
(503) 244-5782
List Price: \$39.95

Requires: 256K RAM, one floppy disk drive, DOS 2.0 or later.

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Place SOURCE Diskette in Drive A.

Press any key to proceed.

Reading track 24, Side B

Place TARGET Diskette in Drive B.

Press any key to proceed.

Before it instructs you on how to insert source and target disks in your drives, *Copy II PC* gives a stern reminder of the section of the federal copyright law that applies to copying software.

REPRODUCES PROTECTION In most cases, *Copy II PC* defeats copy protection by reproducing it—in short, it copies original disks and leaves copy protection intact. But it will make as many of these archival copies of the original as you like. You end up with duplicates that have the same restrictions as the original. If a program can be run from your hard disk only if the system or keydisk is in drive A, your new *Copy II PC* version of the program will behave the same way, so you still have the irritation of having to use a keydisk. However, *Copy II PC* also has a memory-resident utility program, called Nokey, that fools software into thinking that the keydisk is in drive A. It essentially monitors the program and watches for requests to check drive A. Then it issues status or function result codes to the program as if it had found the keydisk.

Using *Copy II PC* is as easy as putting the disk in the drive A: and typing "copyiipc". If you have two floppy drives, you can start the program by typing "copyiipc a: b:". That's it. The program will prompt you for the source and target disks. Could it be any simpler?

Sometimes the standard *Copy II PC*

procedure isn't enough. In these cases, Nokey may be the answer. Some protection schemes put marks or signatures on a disk with nonstandard disk-duplicating devices, so they cannot be duplicated by the standard *Copy II PC* approach. One example is PROlok, which burns a hole in the disk with a laser. Obviously, the hole can't be copied or duplicated electronically. In a case like that, Nokey sends a result code to the protection checker that resembles the response it would get if the hole were really there.

To use Nokey, you use the normal DOS COPY command to copy the NOKEY.COM file onto your backup system floppy—if there is enough room—or onto your hard disk. Nokey can be loaded from anywhere, including, of course, the *Copy II PC* disk, but it has to be resident in memory before you start backing up the program.

There is another utility, called Noguard, in the *Copy II PC* repertoire. It works on SUPERlok protection. Software guarded by SUPERlok places nonstandard marks on the disk so that it also cannot be duplicated with the copy-protection intact. Noguard makes archival copies of such

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ULTIMATE EGATM



Comparing the features

Features	ULTIMATE EGA +	Genoa Super EGA	Quadram EGA Prosync	IBM EGA	Paradise PAEGA
Compatible with EGA	*	*	*	*	*
Compatible with CGA and MDA	*	*	*	* (1)	*
Compatible with Hercules	*	*	*	*	*
Automatic Switching among EGA, CGA, MDA and Hercules Modes	*	*	*	*	*
Video Memory Size	256K	256K	256K	64K	256K
Runs 132 columns on among EGA and TTL Monochrome Monitor	*	*	*	*	*
Supports VEGA Display resolution (640 X 480)	*	*	*	*	*
Special G-Font Mode displays up to 8192 programmable characters in 16 colors (2)	*	*	*	*	*
Microsoft Bus Mouse Compatible interface	*	*	*	*	*
Parallel Printer Port	*	*	*	*	*

(1) Compatible only to the BIOS level, will not be compatible with most game software

(2) Standard G-Font provides up to 2048 characters, 1 Mbyte memory required if up to 8192 characters

One card does it all by JUKOTM G7 series.

Features	G7-A	AUTO G7-A	G7-A5	G7-B	AUTO G7-B
Compatible with CGA and MDA	*	*	*	*	*
Compatible with Hercules	*	*	*	*	*
Connects to composite Green/Color Monitor	*	*	*	*	*
Connects to 640 X 480 Hi-Res Color Monitor (Max Scan rate 24.75KHz)*	*	*	*	*	*
Connects to PAL/NTSC system TV	*	*	*	*	*
Microsoft Bus Mouse compatible interface	*	*	*	*	*
Parallel printer port	*	*	*	*	*
Game port	*	*	*	*	*
Light Pen interface	*	*	*	*	*
Runs CGA software on a TTL Monochrome Monitor	*	*	*	*	*
Software selectable CGA and MGA	*	*	*	*	*
Serial RS232C port	*	*	*	*	*
Clock/Calendar standard	*	*	*	*	*
Floppy Disk Drive controller	*	*	*	*	*

* Optional Modulator required (A) Serial Port Controller (8250 and 16450) (B) Two Serial Ports (One Standard One Optional)

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■ COPY PROTECTION

software by separating the copy protection from the rest of the program.

HIDDEN FILE Noguard loads a hidden executable system file into the computer's memory so that it will copy the file to your hard disk as it was originally written—before the copy protection was added. Most of the software Noguard liberates has a system file with a .COM extension that loads the hidden file. When Noguard is finished, the main system file will have an .EXE extension (or it will keep its .COM extension if that was the way the original was written), and if you ask for a directory listing it will show its true byte size.

After using Noguard, you have a non-copy-protected version of the software. If you need to use Noguard after making a backup with the standard *Copy II PC* procedure, a message to that effect will be displayed on the screen. If the backup doesn't load or run properly and you don't see that message, you should try using Noguard anyway.

Noguard can also be used to liberate programs installed on a hard disk. To do this, Central Point suggests you first follow the manufacturer's directions to install the original program and even run the set-up procedure to configure the program to your system. When that is finished, you return to the DOS prompt in the program subdirectory, put the *Copy II PC* disk in the drive A:, type "anoguard a: c:", and press Enter. You will then be prompted to put the copy-protected program's original system disk in drive A: and press Enter again.

The copy Noguard produces can be copied by using the normal DOS COPY command. You won't have to worry about losing your install count if something happens to your hard disk, and you won't have to use the program's uninstall or copyoff procedure. You will also never have to put the system disk in drive A: to operate the program.

Copy II PC's documentation lists 200 programs and indicates which copy-protection-liberating procedures you should use. But *Central Point* says *Copy II PC* will handle many more programs. You can call the company to learn which those are or try the various procedures and see what happens. As long as you put a write-pro-

test tab on your original disks, you can't harm them by trying to use *Copy II PC*.

Copy II PC Option Board

In addition to the *Copy II PC* software, Central Point Software produces the *Copy II PC Option Board*, which will work on more programs than the software does alone. The Option Board comes with software, but the program provided with the board is different from the regular *Copy II PC* software.

The combined package that you get with the Option Board is really a disk-duplication system that can copy virtually any software program. It doesn't remove copy protection. Instead, it duplicates originals as many times as you like, giving you what amounts to an unlimited installation counter. But it leaves the copy protection and its restrictions intact. The Option Board is able to copy more programs than the *Copy II PC* program because it loops around the IBM floppy controller. It will work on IBM, Apple II, or Atari software. It is intended for people who have to back up a great many different programs, or who don't want to bother worrying about



FACT FILE



Copy II PC Option Board
Central Point
Software Inc.
9700 SW Capitol Hwy.
Portland, OR 97219
(503) 244-5782
List Price: \$95

Requires: 256K RAM, one floppy disk drive, DOS 2.0 or later.

In Short: A hardware/software combination that functions like a disk-duplication system that makes an unlimited number of duplicates.

CIRCLE 650 ON READER SERVICE CARD

updates for every little change to copy-protection schemes on new program releases.

The Copy II PC Option Board uses the same technology used in expensive professional disk-duplication systems. Because the operational approach has been simplified, Central Point has been able to shrink the system down to a chip and package it on an inexpensive \$95 board. It isn't a large premium over some software-only systems that handle fewer copy-protected

TRANSCOPY V4.3
(C) 1985-1987 by CENTRAL POINT SOFTWARE, INC.

```
Source drive:      A      LENGTH: 1864.0
Target drive:      A      LENGTH: 1860.0
```

Starting track: 00
Ending track: 27

Track increment: 01

Number of sides: 2

Keep track length? N

Copy weak bits? N

```
Copy across index?  Y
Verify write?      Y
```

```

HEX 000000000000000111111111111177777777
TRAC 0123456789ABCDEF0123456789ABCDEF0123456789

```

SIDE 0:
SIDE 1:

MESSAGES

Disk was GOOD.
Insert next disk and
press a key.

Good disks: 1

Bed design: B

Disk type: MFM

The software that comes with the Copy II PC Option Board will tell you when a workable copy of a program has been produced.

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IBM 2200 VLS
COPYSTAND 11111111111111111111
ALICE LAMARCA 11 1986

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Deferred charges	\$1,200
Deposits	\$5,000
Prepaid expenses and other current assets	\$0.000
TOTAL CURRENT ASSETS	\$105,422
FIXED ASSETS	
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Buildings	\$1,000
Leasehold improvements	\$1,000
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Less: Accumulated depreciation and amortization	(30,000)
FIXED ASSETS, NET	\$63,000
	\$1,000,000



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**Tilt/Swivel
\$29.95**



Printer Stand \$19.95

■ COPY PROTECTION



Performance Tests: Copy-Protection Liberators

(Products listed in ascending price order)

Uniclock MasterKey was the fastest program tested. However, only the Copy II PC Option Board was able to remove copy protection from VP-Expert. Other vendors reported that removal schemes for VP-Expert had not been developed because VP-Expert is available in an unprotected version. Copy II PC's slow performance on 1-2-3, Release 2.01, Symphony, Release 1.2, and Framework II was the result of both the standard and the Nanguard procedures having to be run. CopyWrite works only on the .EXE file rather than on tracks to remove protection from 1-2-3.

Release 2.01, Symphony, Release 1.2, and Framework II. Disk Mechanic recorded the same times on these programs as CopyWrite because it uses Unguard according to a licensing agreement from Quaid Software, maker of CopyWrite. HerdRunner, from Nostrodomus, was omitted from this test because it does not remove copy protection. It merely allows you to run early versions of 1-2-3 and Symphony from your hard disk without a keydisk.

Products Backed Up (Times given in minutes: seconds)

	List price	1-2-3, 1A	1-2-3, 2.01	Symphony, 1.2	Framework II	VP-Expert	PFS:Report
Copy II PC Central Point Software Inc.	\$39.95	2:55	4:43	4:24	5:03	Failed	2:32
CopyWrite Quaid Software Ltd.	\$50.00	3:33	0:50	0:51	0:59	Failed	2:32
Disk Mechanic MLI Microsystems	\$70.00	5:36	0:50	0:51	0:59	Failed	3:07
Copy II PC Option Board Central Point Software Inc.	\$95.00	3:07	2:40	2:37	2:59	2:31	3:11
U niclock MasterKey TranSec Systems Inc.	\$159.95	0:36	0:34	0:31	0:36	Failed	0:15

Indicates Editors' Choice

The **Copy-Protection Liberator** performance test measures how long it takes for copy-protection-liberator software to create a backup set of main program files for

six major copy-protected programs. The tests were conducted on a 6-MHz IBM PC AT with a 30-megabyte hard disk and 512K bytes of RAM.

programs. Not only does the Option Board copy just about any program, it is so versatile that updates are rarely needed. Despite that flexibility, you will still need a keydisk, even if it is a copied one, to access the protected program.

MANY FORMATS Most copy-protection schemes rely on the limitations of the floppy-disk controller, laying down strange data in the sector tracks, altering the normal sector IDs, stretching the gaps between sectors, or playing games with the sync bytes, address marks, and clock bits. The controller can recognize that something improper has been placed on a disk, but it can't duplicate it. The Option Board, on the other hand, transfers every bit of data—no matter how foreign in appearance—from the original disk to a backup disk. If the controller card speaks only one language, the Option Board is a universal interpreter. It can cope with FM (Atari) and GCR (Apple) disk formats in addition to the MFM format of IBM PCs and compatibles or Kaypro and Amiga computers.

The Option Board can't handle the Commodore or Macintosh formats because their data rates (similar to drive speeds) are very different from the data rate on an IBM disk.

The Option Board is as straightforward as the *Copy II PC* program. But installing it can be a headache. For most installations, all you have to do is slip the board into an empty slot and close the computer. But with this you also have to connect a cable to the floppy-disk controller or to the motherboard and reconnect the cable from the floppy-disk controller to the Option Board. In essence, you put the Option Board between the controller card and the motherboard so that you can bypass the controller.

The installation process differs slightly by computer type. In the IBM PC and XT, you remove the cable from the controller, move the controller card over one slot, and put the Option Board in its place. Then you connect the controller cable to the edge connector of the Option Board and connect the Option Board cable to the edge connector

of the controller. There are several sets of jumpers on the Option Board that may have to be reset—depending on your computer system. The manual explicitly describes these settings, so there's no guesswork.

In some computers, the installation process is much more difficult. In an ITT Xtra XP (an IBM PC-XT compatible), for example, you have to remove the whole floppy and hard disk housing to get to the pin connector on the motherboard, where the Option Board cable has to be plugged in. After the drives are bolted back on the motherboard, the rest of the procedure is fairly easy. The tech support people at Central Point are good at fielding questions about installation and can help you with the task.

DEFAULT SETTINGS Like *Copy II PC*, the Option Board lets you issue program commands at the DOS prompt. You might, for example, type "tc a: b:" to copy an original from drive A: to a target disk in drive B:. If you just type "tc" (for

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CIRCLE 183 ON READER SERVICE CARD

■ COPY PROTECTION

transition copier), the system will return a menu to the screen. The menu lets you set the source drive, the target drive, the starting and ending track numbers, the track increment, and the number of sides. It also lets you turn on several other options that let you do things like keeping the track length or copying weak bits. Central Point says that the default settings will do the job 98 percent of the time.

On the right side of the menu screen, there is a message window that explains the menu fields as you move through them. It also displays information you might need during the copy procedure. For example, if you forget to put the source disk in drive A:, a message will remind you to do so.

A track status display appears at the bottom of the screen when the copy operation begins. The tracks are numbered in hexadecimal. Beneath that there is a line for each side of the disk. As a track is read, an "R" appears under the track number first for side zero and then for side 1. After a track is read, an "A" flashes up to indicate it is being analyzed. A "W" appears as it is being written to the target disk. Finally, when the track has been verified a "." will appear under the track number. So, when the whole operation is finished, the two lines for the sides will have a row of dots across them.

Occasionally a "V", indicating a write verify error, will be displayed for a track. This may indicate that the target disk is bad. But sometimes the "V" is spurious. The company suggests you try the disk before deciding it is bad. Also you may sometimes see a "K", which only means that the program couldn't keep the track length exact. It will not interfere with the functioning of the program.

The Option Board includes a track editor, called TE.COM, as well as support for an automatic disk loader called TCLOAD-ER.EXE. The disk loader support is intended for duplication firms that want to use the Option Board as part of a full-fledged disk-duplication business. It requires equipment not supplied with the Option Board.

The track editor lets you see the format of an original program disk. It won't help you copy disks that TC won't copy, unless you have a very sophisticated understand-

ing of copy protection. It is an extra feature that isn't necessary to operate the system. But if you understand disk formats, the editor lets you look at the data on any track in both hex and ASCII, modify data on any track, inspect sector IDs on a track, and look at both data and clock bits.

DAMAGED DISK There is one type of protection scheme the Copy II PC Option Board can't handle—the kind that uses physical damage to the disk as part of the protection—so it won't work on programs that use PROlok. But there is a \$195 advanced version of the Option Board that can work with physical protection schemes. Physical protection schemes are so rare today that Central Point doesn't even advertise the advanced Option Board. Otherwise the Option Board is the most gifted of backup systems. It will copy virtually any protected software.

CopyWrite

CopyWrite is a group of utilities that outwit copy-protection schemes on five fronts. The namesake utility, CopyWrite, produces copies with the copy protection intact—in essence it reproduces originals.

FUNCTION		OPTION
April 1987		
Source drive	a:	
Source file	123.COM	
Target drive	c:	
Run source		
License		
Exit to DOS		
KEYS PURPOSE: F4 color ↑ ↓ select function + - change drive Letter file name Enter do function		
Authors: Robert I McQuaid Frank Klein		
Copyright (c) 1987 Quaid Software Ltd		

When you use CopyWrite's UnGuard routine, you set the parameters that will create an unprotected version of the software, as we did here with 1-2-3, Release 2.01.



FACT FILE

CopyWrite

Quaid Software Ltd.
1000 University Avenue
Suite 1000
Toronto, Ontario
Canada M4Y 1S2
(416) 961-8243
List Price: \$50, US:

\$66, Canada

Requires: 128K RAM, two disk drives,
DOS 2.0 or later.

In Short: A group of utilities that enable you to reproduce originals of 250 releases of copy-protected software and to run games without using a keydisk. Not copy protected.

CIRCLE 687 ON READER SERVICE CARD

UnGuard, a second utility, actually removes copy protection from the programs (mostly those protected with SUPERlok). When UnGuard is done, you can use the DOS COPY command to make backups. The three other utilities in CopyWrite work with more-difficult copy-protection schemes and provide a way of bypassing at least some of the annoying constraints, such as having to use a keydisk in drive A:



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CIRCLE 224 ON READER SERVICE CARD



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software
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hard drive

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Trade-in older versions of CopyWrite & ZeroDisk for \$18.00 U.S., by returning the original diskette to Quaid Software Limited.

System requirements are an IBM PC, XT or AT, 128K or more of memory and at least 1 diskette drive.

CopyWrite is not for use in producing copies for sale or trade.

CopyWrite \$50.00 U.S. \$

Revision \$18.00 U.S. \$
* Revision orders must be accompanied by the original CopyWrite or ZeroDisk diskette.

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Name _____
Company _____
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City _____
State _____ Zip _____
Signature _____



45 Charles Street East
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Toronto, Ontario M4Y 1S2
(416) 961-8243

Quaid Software Limited

■ COPY PROTECTION

to run a program on your hard disk.

CopyWrite works on some 350 programs and program releases. Many other programs may also work with CopyWrite, but they haven't been officially acknowledged by Quaid Software, the Canadian company that produces it.

Of all the utilities in the package, you'll use CopyWrite most often. It handles 250 different program releases, working on protection schemes that can be read and duplicated through the IBM floppy-disk controller. This kind of copy protection tends to appear in older products or earlier versions of some programs. UnGuard works with more-recent product releases in which the protection can't be duplicated through the IBM controller. For example, the CopyWrite utility will copy 1-2-3, Release 1A, and Symphony, Releases 1.0 or 1.01, but you have to use UnGuard to copy 1-2-3, Releases 2.0 and 2.01, or Symphony, Releases 1.1 and 1.2. UnGuard works with 77 program releases. The CopyWrite manual lists the programs each utility will back up.

STARTING THE PROGRAM To run the CopyWrite utility, you put the CopyWrite disk in drive A: and type "copywrite". This brings up a vertically split screen with program information on the left and utility parameters on the right. The information on the left side includes an explanation of a few program command keys in addition to listing the edition date, the names of the program's authors, the copyright, and the size of the available work space.

The parameter fields prompt you for the source and target drives, the number of sides, and number of tracks. In most cases, the default settings can be left as they are. The last two settings in particular are rarely changed. But some programs require you to set the number of sides to one rather than two because they are floppy disks, or because they have a non-IBM version on the reverse side.

If you have a hard disk and only one floppy disk drive, the utility program will prompt you halfway through the copy procedure to switch the original disk for the target disk in drive A:.

UnGuard functions much like the CopyWrite utility. The main difference is you

are not copying a whole system disk, just the file on the system disk that carries the copy protection. CopyWrite's manual lists the file you need to work on. UnGuard is loaded from the DOS prompt, so it acts like an independent program. The split screen that comes up has slightly different parameters to set. In addition to the source and target drives, you have to name the file to unprotect. There are no fields for the number of sides and tracks since this information doesn't apply.

If you're copying to a hard disk, the best approach is to create the subdirectory first, enter it, and then go to drive A: to load UnGuard. You can't specify a path on the UnGuard screen. Once it starts to strip the copy protection UnGuard is quite fast. But, since the utility works on only one

■ CopyWrite is a group of utilities that outwit copy-protection schemes on five fronts.

file, the rest of the system files have to be copied to your hard disk using the DOS COPY command.

OTHER UTILITIES The three other utilities in CopyWrite—ZeroDisk, Ramkey, and SoloBoot—let you run software without using a keydisk and are memory resident. Strictly speaking they are not copying programs. When ZeroDisk or Ramkey is loaded from the DOS prompt, all you see on the screen is a logo box with the name, address, and phone number of Quaid Software—the rest of its functioning is invisible. You use ZeroDisk with the original system files of a software program running from your hard disk. It saves you from having to put the original system disk in drive A: Ramkey does the same thing, but it works with programs that have been copied first with the CopyWrite utility.

SoloBoot works mainly with game programs. It enables you to run self-booting games without a keydisk. SoloBoot works with both original files and with copies

■ COPY PROTECTION

made through the CopyWrite utility.

With its five-pronged attack, *CopyWrite* handles a large percentage of the programs out there that are still copy protected. It takes the shortest, simplest approach with most programs by reproducing originals. But if that won't work, it will strip the copy protection, or at least let you run an original program from your hard disk without using a keydisk. It takes anywhere from 1½ to 10 minutes to make a backup copy with the program, depending on the software and its protection scheme.

Disk Mechanic

Disk Mechanic is a sophisticated \$70 utility program that can do much more than break copy-protection schemes. You should either have a thorough knowledge of disk formats or be willing to take the time and effort to learn them in order to use most of *Disk Mechanic's* routines. Its maker, MLI Microsystems, regards *Disk Mechanic* as an educational tool as much as a functional tool-kit utility program.

The program has three key utilities: track and sector tools; file tools; and backup, copy, analyze, and format tools. The backup tools were tested for this review.

The backup tools take three different approaches to conquering copy protection. The easiest is with several automated routines that you access by pressing the F3 key at the main system menu and F1 at the backup menu.

After responding to several ques-

Drive-H, track= 0, side= 0, sector= 1, section= 1

0:EB 34 98 49 42 40 20 28	33 2E 32 08 02 02 01 08	84610H	3.2....
1:02 70 00 00 02 F0 02 08	09 08 02 00 00 00 00 00	.p.#.2..
2:00 08 00 00 00 00 00 00	00 00 00 00 00 00 00 0F
3:00 08 00 00 01 00 FA 33	08 0E D0 0C 00 7C 16 07	3 468H 1..
4:00 70 00 36 C5 37 1E 56	16 53 0F 2B 7C 09 08 08	px.677.0	.5.#+11..
5:0C AC 26 00 30 00 74 03	26 0A 05 AA 0A 04 E2 F1	%465=.t.	00.-00-F2
6:06 1F 09 47 02 C7 07 2B	7C F8 CD 13 72 67 00 10	.0C.#.+	14=.regd.
7:0C 90 F7 26 16 7C 03 06	1C 7C 03 06 0E 7C A3 3F	19=0.1..	11..167
8:0C A3 37 7C 00 20 00 F7	26 11 7C 08 1E 0B 7C 03	1671y	= 8.11.1.
9:03 48 F7 F3 01 06 37 7C	00 00 05 A1 3F 7C 08 96	[H=5..7]	q..17100
A:00 00 01 02 03 00 00 72	19 08 F8 09 00 00 0E CD	.1..5..+.	1.44]..#
B:7D F3 A6 75 00 00 77 28	BE D0 7D 09 00 00 F3 A6	35%u.1a	44]..5#
C:74 10 08 6E 7D 03 61 00	32 E4 CD 16 5E 1F 0F 04	t.dn)5a.	22=-.A.
D:0F 44 02 CD 19 0E 07 70	EB EB A1 0E 05 32 D2 F7	AD=-.d#)	661..3#
E:36 08 7C FE 08 A2 3C 7C	A1 37 7C A3 3D 7C 08 00	6.1u46<1	1716=1q.
F:07 A1 37 7C 08 00 00 A1	10 7C 2A 06 3B 7C 4B 50	.17100.f	1..u.10P

17-1 27-1 35-1 43-1 5105 6 72005 8 927005 10000

Disk Mechanic's sector utility tells you what is happening on the disk's tracks, as it did here with the first sector on Track 0 of Side 0 of 1-2-3, Release 2.01.

tions—such as what track to start and end with, what the source and destination drives are, and whether or not CRC (Cyclic Redundancy Check) errors should be verified—the program is off and running. The track number being copied is displayed on the lower-right-hand side of the screen. This automatic routine works through the standard IBM floppy-disk controller, so if the copy-protection scheme used special equipment to put a signature on the original disk, the automatic routine may fail.

AUTOMATIC UTILITIES To deal with nonstandard signature schemes, *Disk Mechanic* has included two other automatic utilities that are, according to MLI, special versions of utilities from Quaid Software, in Canada, makers of *CopyWrite*, which is also reviewed in this article. The tool that works with the most programs is Unguard, and it is identical to the UnGuard utility in Quaid's *CopyWrite*.

You have to invoke Unguard from the DOS prompt. *Disk Mechanic* responds with a vertically split screen that has Quaid's copyright displayed on the left with a credit to Unguard's authors, includ-

ing Robert McQuaid, president of Quaid Software. On the right are the same copying parameters you would see in the *CopyWrite* version of the utility: the source disk location, the file name to be unprotected, and the target drive.

As with *CopyWrite*, you can't specify the path, so you should first establish a target subdirectory on your hard disk and then go to drive A: to load Unguard. After that you can put the program system disk in drive A:, set your target drive for C:, and then start the backup process by moving the cursor to the Run Source command and pressing Enter. When the routine is finished—it takes only a few seconds—you will have an executable version of the main system file on your hard disk. Then you just copy over the other system files to have a complete program.

The operation appears identical to the utility in *CopyWrite*. MLI supplies a list of more than 70 releases Unguard will liberate, almost exactly the same as the list *CopyWrite* offers. *Disk Mechanic* has added *PC Bond Manager*, *Bondcalc/Bonddata*, Version 4.1, and *Bondman*, Version 3.1; *Reva Pro-Value Program*; *Residential Realtor*; and *MicroRealty*, Version 2.0, re-



FACT FILE

DISK MECHANIC

Disk Mechanic
MLI Microsystems
P. O. Box 825
Framingham, MA 01701
(617) 879-2000
List Price: \$70
Requires: 256K RAM,
one floppy disk drive.

DOS 2.0 or later.

In Short: Requires a knowledge of disk-formatting concepts and techniques, although there are some automatic routines. Most useful as a set of utilities. Not copy protected.

CIRCLE 656 ON READER SERVICE CARD

■ COPY PROTECTION

vision B. It has dropped *Chartist*, Version 4.01. Unfortunately, MLI does not supply a list of the source filenames with these programs, as Quaid does.

The other automatic utility in *Disk Mechanic* is called NoLok. In *CopyWrite* it is called Ramkey. If you run NoLok, you will see the exact same logo box Ramkey displays when it is run. Since both programs are memory resident, it is hard to tell if there is any difference in their operations. MLI does not provide a list of programs that require the use of NoLok.

Disk Mechanic encourages the user to try the do-it-yourself approach to breaking copy protection. You don't have to start from scratch with every program. There are some 40 or 50 files in the program that have customer-supplied guidelines for getting around copy protection on specific packages. You can read these files by using the DOS TYPE command at the drive prompt. However, the authors of some of these files tell you their approach may not be complete. Using their suggestions requires a fair amount of knowledge about sectors and tracks. The uninitiated may view it all as gibberish.

USING TOOLS To use these suggestions you must use the analyzing, copying, and formatting tools *Disk Mechanic* provides. The tools let you do things like read the address or ID marks on selected disk tracks, read the FDC error codes, change the format gap length, remove CRC errors, and so on. To use these facilities to break copy protection, you may also have to go to the track and sector tools area of the program. Here you can display or modify sector data, zero sector data, compare track data to sector data, and so forth. These different utilities are activated with function keys.

The file-oriented tools in *Disk Mechanic* let you do a number of useful things. For example, if you use the disk directory command, you get a list of the hidden files in addition to the normal files. Erased files are not displayed, but they can be found by using the sector utility program to examine the sectors following the File Allocation Tables. The file tools also enable you to "unkill" or recapture an erased file if a new file hasn't been written over it.


Disk Mechanic is not easy to use—not

because its operations are difficult to initiate or because they are buried behind arcane commands, but because you must have a solid understanding of sectors, tracks, clock bits, File Allocation Tables, gap length, character strings, and other disk format concepts. If you know all that or are up to learning it, this program lets you get into the guts of copy protection. As a result, this program can sometimes work on programs such as *Javelin*—in which automatic routines fail. If the hands-on approach appeals to you, *Disk Mechanic* may be just what you want.


HardRunner

HardRunner is a relic of the past. It does not remove copy protection, but it gets around it by letting you run programs without a keydisk. Memory resident, it only works on early versions of 1-2-3 (Releases 1A and 1A*), early versions of *Symphony* (Releases 1.0 and 1.01), and copy-protected *SideKick*. That is all it does. The program never addressed the later versions of Lotus's software, nor did it add the ability to work with other copy-protected software.

Representatives of Nostradamus say the program continues to sell well, howev-



FACT FILE



HardRunner
Nostradamus Inc.
3191 S. Valley St. #252
Salt Lake City, UT
84109
(801) 487-9662
List Price: \$49.95
Requires: 128K RAM,
two disk drives, DOS 2.0 or later.

In Short: A survivor with limited capabilities. Works only on early versions of 1-2-3, *Symphony*, and *SideKick* at a comparatively high price. Not copy protected.

CIRCLE 888 ON READER SERVICE CARD

er. Many companies with strict policies against illegal copying of software purchase large quantities of *HardRunner*, they say, rather than programs that remove copy protection, in order to ensure that employees will not copy the Lotus programs.

HardRunner lets you run these packages without a keydisk but it leaves the copy protection on the hard disk. Although it gives you four installs—which is more than many copy-protected programs will allow—it is still a limitation. You also

```
This program is used to install HardRunner. Once you have installed
HardRunner it can be activated by typing the command "keydisk"
HardRunner should be activated only once each time you start your system.
```

```
Would you like an entry (or hint) placed in your AUTOEXEC.BAT
file so that HardRunner will be automatically activated every time
you start your system? (Y or N)

```

```
HardRunner will now be installed from the HardRunner directory.
Where would you like HardRunner installed?

```

```
Example: Enter "c:\n" for the root directory of your C drive.
Enter "d:\mydir" for a directory on drive D

```

```
c:\n

```

```
OR

```

```
GOOD JOB, HARDRUNNER HAS BEEN INSTALLED.

```

```
Remove the HardRunner diskette and Boot (Ctrl+Alt+Del)
your system to test your automatic, or simply issue the
command hintest from c:\n

```

```
*****

```

HardRunner walks you through its installation with a series of questions and answers.

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PC Magazine, 1987

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CIRCLE 132 ON READER SERVICE CARD

■ COPY PROTECTION

have to run an uninstall routine if you're backing up your hard disk. All this is difficult to accept in a package intended to help you get around the inconveniences of copy protection.

EASY TO USE *HardRunner* is easy to install and use. In fact, it doesn't even come with a manual. If you put the disk in drive A: and type **HARDRUN** at the DOS prompt, you will see a question asking you what computer system you have. After you answer, *HardRunner* asks you if you want help. The on-line help is your documentation. It doesn't take more than 10 minutes to go through all the categories on the help menu and install the program. If you install it so it boots as you turn your system on, the program will prepare your

■ *HardRunner* is easy to install and use. In fact, it doesn't even come with a manual.

AUTOEXEC.BAT file for you—or you can do it yourself. If you prefer, the program can be activated manually.

Once installed and started, *HardRunner* is invisible. You can use your early copy of *1-2-3* or *Symphony* or *SideKick*. The *HardRunner* program only uses 800 bytes of memory.

We think programs that remove copy protection are better values. You can purchase *Copy II PC*, for instance, for \$10 less and get more from the program than you can from *HardRunner*. *Copy II PC* will also let you run early versions of *1-2-3*, *Symphony*, and *SideKick* without using a keydisk and will also circumvent the protection of most other software that still is protected.

Nostradamus does tell you of the limits of the program up front. The company lists the effective date in the on-line documentation as April 1985, which should tell you something. Nostradamus also distributes *Copy II PC* and sells it for the same \$39.95 price as its manufacturer, Central Point


Software. *HardRunner*, at its introduction, may have served a useful function, but today there are better values to be had for less money.

UNlock MasterKey

The *UNlock MasterKey* logo screen has a comic-book look to it—red background blocks on a black field, chisel-cut yellow letters with black accent stripes and boxes inside—a concession apparently to new-wave style. But the rest of the program is as bare-bones as you can get and still have something with which to interact. But for all its simplicity, *UNlock MasterKey* provides a fast and able means for unlocking copy protection. *UNlock MasterKey* gives you three unlocking routines that work on most of the well-known, still-protected packages.

The program comes up to the colorful logo screen, then two introductory screens—one with TranSec Systems' address and phone number, the second with a disclaimer that warns you not to copy software illegally. Then it takes you straight to menu screens that list copy-protected programs—more than 95 on 14 menu screens—that *MasterKey* will liberate. For

**EDITOR'S CHOICE**
FACT FILE



UNlock MasterKey
TranSec Systems Inc.
220 Congress Park Dr.,
#200
Delray Beach, FL 33445
(800) 423-0772
(305) 276-1500 (in Fla.)
List Price: \$159.95

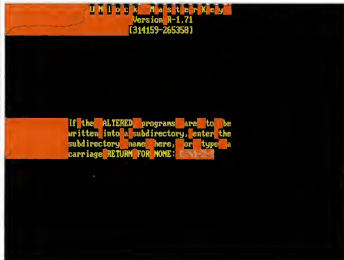
Requires: 256K RAM, one disk drive, DOS 2.0 or later.

In Short: Somewhat expensive but fast and liberates more than 95 individual programs with three generic: liberating routines for SUPERlok and PROlok protection schemes. Not copy protected.

CIRCLE 884 ON READER SERVICE CARD

each protected program and its various releases, *MasterKey* has a canned program to release the copy protection and put the program on your hard disk. *MasterKey* works on PROlok and SUPERlok protection schemes.

THE POPULAR AND EXOTIC *MasterKey* works on the popular and on the exotic, including *dBASE III* and *III Plus*,



TranSec Systems' *UNlock MasterKey* requests a subdirectory name before it will create an unprotected version of *1-2-3*, Release 2.01.

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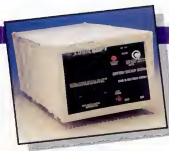


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■ COPY PROTECTION

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Once installed and started, *HardRunner* is invisible. You can use your early copy of *1-2-3* or *Symphony* or *SideKick*. The *HardRunner* program only uses 800 bytes of memory.

We think programs that remove copy protection are better values. You can purchase *Copy II PC*, for instance, for \$10 less and get more from the program than you can from *HardRunner*. *Copy II PC* will also let you run early versions of *1-2-3*, *Symphony*, and *SideKick* without using a keydisk and will also circumvent the protection of most other software that still is protected.

Nostradamus does tell you of the limits of the program up front. The company lists the effective date in the on-line documentation as April 1983, which should tell you something. Nostradamus also distributes *Copy II PC* and sells it for the same \$39.95 price as its manufacturer, Central Point

Software. *HardRunner*, at its introduction, may have served a useful function, but today there are better values to be had for less money.

UNlock MasterKey

The *UNlock MasterKey* logo screen has a comic-book look to it—red background blocks on a black field, chisel-cut yellow letters with black accent stripes and boxes inside—a concession apparently to new-wave style. But the rest of the program is as bare-bones as you can get and still have something with which to interact. But for all its simplicity, *UNlock MasterKey* provides a fast and able means for unlocking copy protection. *UNlock MasterKey* gives you three unlocking routines that work on most of the well-known, still-protected packages.

The program comes up to the colorful logo screen, then two introductory screens—one with TranSec Systems' address and phone number, the second with a disclaimer that warns you not to copy software illegally. Then it takes you straight to menu screens that list copy-protected programs—more than 95 on 14 menu screens—that *MasterKey* will liberate. For



EDITOR'S CHOICE

FACT FILE



UNlock MasterKey
TranSec Systems Inc.
220 Congress Park Dr.,
#200
Delray Beach, FL 33445
(800) 423-0772
(305) 276-1500 (in Fla.)
List Price: \$159.95

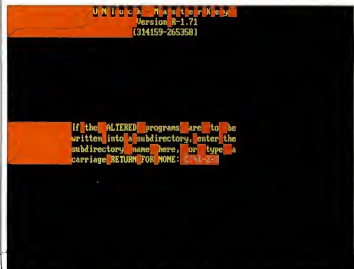
Requires: 256K RAM, one disk drive, DOS 2.0 or later.

In Short: Somewhat expensive but fast and liberates more than 95 individual programs with three generic liberating routines for SUPERlock and PROlock protection schemes. Not copy protected.

CIRCLE 664 ON READER SERVICE CARD

each protected program and its various releases, *MasterKey* has a canned program to release the copy protection and put the program on your hard disk. *MasterKey* works on PROlock and SUPERlock protection schemes.

THE POPULAR AND EXOTIC *MasterKey* works on the popular and on the exotic, including *dBASE III* and *III Plus*,



TranSec Systems' *UNlock MasterKey* requests a subdirectory name before it will create an unprotected version of *1-2-3*, Release 2.01.

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■ COPY PROTECTION

Version 1.0; *Dollars and Sense*, Version 2.0; *Double DOS*; *Erunacad*, Version V110B; *Fastback*, Version 5.3; *Harvard Total Project Manager*, Version 1.10; *Managing Your Money*, Versions 1.5 through 2.0 and 3.0; *Microsoft Word*, Versions 1.15, 2.0, and 2.01; the *PFS*: series; *Print Shop*, Version 1985; *SideKick*, Version 1.56B; *Sight Master*, Versions 5.1, 5.03, and 5.05; *Spotlight*, Version 1.0; *Star Trek: The Kobayashi Alternative*; *Symphony*, Versions 1.1 and 1.2; *Think-tank II*, Versions 2.0 and 2.1; *Type 1* 1987; *Video Store Manager* 1986; and *Westinghouse NumaLogic*, Version 2.1.

TranSec adds programs to *UNlock MasterKey* every month or two, and the upgrades cost \$35. These additions come from work the company does for individual clients. TranSec will circumvent the protection scheme on a program for a customer at a charge of \$200 if the protection is software based, and \$300 if it is hardware based. If the program is popular, it is added to *MasterKey*. John Griffith, president of TranSec, says the company is generally "swamped" with requests.

Once you've selected your program from one of the menus, you simply type the source drive at the prompt (the default is A:) along with the destination drive (the default is C:) and the name of the subdirectory. If you haven't previously created a subdirectory, the program will do it for you. Some of *MasterKey*'s liberating routines work best if you don't use a previously installed subdirectory. Those that need special attention are listed in the appendix.

After you respond to the prompts, the program takes over. You'll hear the customary whirring and clicking as files are read and copied and drives are accessed. Names of files being copied pop up in the middle of the screen. When finished, *MasterKey* thanks you and says, "You may now copy the program you UNlocked using normal DOS commands." You are told to copy the rest of the program files into the same subdirectory. That's it. Your next keystroke returns you to the first page of program menus.

You can take protection off programs not listed in the menus by using generic routines. First determine if the program is protected by PROlok or SUPERlok. Then place the system disk in drive A:



EDITOR'S CHOICE

• UNlock MasterKey

Don't buy these copy-protection crackers to steal software. Copying programs illegally could cost you your job at many companies and with good reason. You should buy these products because you want to back up the software you own, and because you don't want your hard disk affected by the insidious hidden programs some copy-protected software uses.

Each of these products performed well. All did the job they professed to do. We liked UNlock MasterKey from TranSec Systems, because it doesn't copy software, it removes the copy protection and that's what we want. We also liked the speed at which it removed the copy protection and the informative documentation that accompanied the package. UNlock MasterKey is simply the most elegant of those we tested and is well worth its \$159.95 price. If you prefer economy to speed, however, you might consider Copy II PC, the software, which—at \$39.95—was the least-expensive program among those we reviewed.

Finally, if you're using copy-protected software that's more than a year old, you may have a better option: upgrading to the current version. You'll get more features and capabilities and no copy protection.

and press F1 to identify SUPERlok protection or F2 to identify PROlok protection. With PROlok you must test the main program file.

SUPERLOK SCHEMES To remove protection from programs protected by SUPERlok, you indicate the key file used to run the program. In many cases this is a .COM file of around 2,016 or 3,036 bytes. For example, the 1-2-3 key file is

123.COM, which has 2,304 bytes. After you specify the file you want to be unprotected, the generic SUPERlok liberator works much like the other canned routines.

If the unprotected copy doesn't load or run properly, it may be because the SUPERlok protection scheme corrupted the disk header—a table that lists the file sizes and addresses and register values. *MasterKey* automatically detects and corrects most of the header errors. But it won't if it is unsure about reconstructing the header. Instead it will display a message to this effect on the screen. Then you can do manual header reconstruction by pressing the F3 key and filling in the drive, directory, and name of the problem file.

For the hard disk version of SUPERlok, the protection-breaking procedure is slightly different. You first have to install the program on your hard disk and then run the routine—sending the unprotected system file to a separate subdirectory.

It works much the same way when you remove protection from programs that use PROlok, except with PROlok you focus attention on a rather large .EXE file—typically the main program file. And with the PROlok routine, you never have to worry about header reconstruction.

There is one other function *MasterKey* lets you perform. You can use the F4 key to get a directory listing of a disk or subdirectory so that you can see how efficiently the space on the disk has been allocated. You can also use it to discover hidden files or see the system and read-only attributes. None of this will help you directly bypass copy protection, but it will help you find out if a disk is copy protected.

If after all this, a protection scheme has you stumped, call TranSec. The company is very responsive.

UNlock MasterKey's canned routines can liberate a program from copy protection two to three times faster than other similar software. But, at \$159.95, the program is a little more expensive than others reviewed here. However, *MasterKey*'s value will increase in the next month or so. TranSec plans to add a generic EVERlok liberating routine and other routines to it. ☐

Henry Fersko-Weiss writes about technology and computers for several national publications.

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Whether they're commercial programs like Flash and Lightning, or built-in software from Compaq and IBM, disk-caching utilities are a cheap, effective way to speed up any PC system.

CACHING IN ON MEMORY MANAGEMENT

■ DISK-CACHING PROGRAMS

performance, the biggest increase for the least investment often can be achieved with disk caching, a software technique that allocates part of your computer's memory to temporarily storing data from one of your disks. Because electronic memory responds about 1,000 times faster than the fastest hard disk, pulling bytes from this buffer of RAM can make your system much more responsive.

In fact, disk caching offers such an immense increase in system performance at such a low cost that you may wonder why it's not included as standard equipment with all PCs. Think about one of the other minimal-cost performance enhancements—for example, a new high-frequency crystal for the early model IBM PC AT—and you may hit upon one reason. Not every PC feature is designed with you in mind. The lack of an obvious and inexpensive speed enhancement could cripple certain systems so that their price-to-performance ratio is in the perfect position to benefit the computer salespeople.

Not that IBM practices predatory sales, but in the face of the proven advantages of

disk caching, the only official memory-based disk enhancement proffered by the IBM-Microsoft operating system conspiracy was a primitive disk buffering system. Although increasing the number of buffers

■ Caching programs can boost throughput by a factor of two or better on high-volume operations.

in your system's CONFIG.SYS file can improve disk performance somewhat, the improvement is almost trivial in comparison to what a smart caching program can do. (See sidebar, "Boosting Buffers for Better Performance.")

Where IBM deigns not to tread, the aftermarket is sure to carve a profitable niche. Years ago, programs like the Personal Computer Support Group's *Light-*

ning and Software Masters' *Flash* started caching in on the caching omissions in DOS. For a minimum of added expense, these programs could make your system more responsive.

PC Magazine gave you an even lower cost alternative, a caching program that was free to all readers who had the patience and wherewithal to type in the assembly language instructions written by programming wizard Steve Holzner ("How to Realize Cache Savings," *PC Magazine*, Volume 4 Number 16). Last year even IBM archival Compaq Computer Corp. joined the caching clutch with its own utility that accompanied its Deskpro lineup.

These caching programs can actually boost total system throughput by a factor of two or better on database sorts and other high-volume operations. The improvement in systems based solely on floppy disks could be 10 to 20 times.

TRUE BLUE CHALLENGER With the coming of IBM's new Personal System/2 earlier this year, IBM abruptly changed (or found) its direction. Included free with its

BOOSTING BUFFERS FOR BETTER PERFORMANCE

DOS includes a rudimentary caching ability in the guise of the BUFFERS statement that you can load in your system's CONFIG.SYS file. Compared with true disk caching, DOS's buffers are only a token speedup scheme, however, because the buffers are dumb.

Adding buffers just makes DOS read more of your disk than it needs. When a program sends DOS off to read one sector of your disk, the BUFFERS statement makes DOS fill the appropriate amount of memory (the number given in the BUFFERS statement times 512) with the next sector or sectors you specified when you started up your system.

The buffering routine doesn't know what's in those sectors or even whether they are connected with the file your program is dealing with. If the disk clusters that store files on your disk are badly scattered, the buffers might load up with entirely irrelevant information. Even the

loading of these unwanted sectors takes time, and if too many useless sectors are loaded too often, you lose rather than gain performance.

Increasing the number of buffers helps expedite disk storage, particularly if you keep the number within reason to avoid wasting time on irrelevancies. Because DOS does try to store file data in contiguous clusters, it will find the information it needs in the sequential buffers a good deal of the time. Disk performance does improve on most hard disks when you increase the BUFFERS statement in your CONFIG.SYS file from its default of 2 or 3 (depending on the DOS version) to 15 to 20.

As you could guess from the use of *dumb* to describe the way that DOS buffers cache-disk information, there is a better way. Smart disk caching software digs a little deeper and looks at what information your system has used. In many

cases the information that DOS has looked at once will need looking at again—for instance, your disk's file allocation table, disk directories, and even file clusters that are referenced often.

By keeping this known-to-be-useful information in fast RAM memory, intelligent caching programs can deliver significantly better performance than the dumb buffering of DOS. Such performance improvements vary with the types of tasks you run on your system, but the downside is minimal.

Different caching programs use different algorithms to determine what to keep in the cache and what to throw away. Although these algorithms have some effect on the performance of the cache, the amount of memory devoted to storing cached data is more important. A bigger cache will likely have more hits; more of the data a program needs will be kept in a large cache.—Winn L. Rosch

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Bill Goodrich, President

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- NEW Checks printed with detailed stub listing, an unlimited number of paid invoices.

NEW Ability to void checks.

- NEW Optional reprinting of checks.
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- NEW New tax laws incorporated into program.
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- NEW Supports Cafeteria Plan.
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■ DISK-CACHING PROGRAMS



Disk-Caching Programs: Summary of Features

(Products listed in ascending price order)

List price	CACHE 2 Free	Flash \$69.95	Lightning \$89.95	Compaq Disk-Cache Utility Incl. with Compaq hardware	IBMCACHE Incl. with PS/2 Models 50, 60, and 80
Cache size	12K-62K	5K-3 Mbytes	0-1.8 Mbytes	128K-2 Mbytes	16K-384K
Caches hard disks with software driver	○	●	●	●	○
Caches hardware-implemented hard disks	●	●	●	○	●
Uses DOS memory	●	●	●	●	●
Uses expanded memory	○	●	●	●	○
Uses extended memory	○	●	○	●	○
Caches floppy disks	○	●	●	○	○
Caches disk writes	○	●	●	○	●
Ignores duplicate writes	○	●	●	○	○
Unloadable or defeatable	○	●	●	●	○

● — Indicates Editor's Choice ○ — Yes ○ — No

PS/2 Models 50, 60, and 80, the company offered a new, nearly invisible program: IBMCACHE.

Like *Flash*, *Lightning*, and Compaq's Disk-Cache Utility, IBMCACHE is an intelligent disk-caching program. As such it offers both improved system throughput for your PS/2 and a serious threat to third-party suppliers of caching software.

For all of its power and potential, however, IBMCACHE has been afforded a minimum of hullabaloo, even by IBM's standards. You won't find IBMCACHE on your DOS disk or on any other disk you get with your system. IBMCACHE consists of only two hidden files on the System Reference Diskette that accompanies recent PS/2 models.

One, IBMCACHE.SYS, is the caching program itself in device driver form. As with the old DOS disk buffering scheme, it loads through CONFIG.SYS.

The other program, IBMCACHE.EXE, is a setup and maintenance utility that installs the cache and allows you to alter the way it works without the need to edit CONFIG.SYS.

Because both of these programs are locked in hidden system files, you can't copy them—you can't even see them in a directory. Moreover, IBMCACHE.EXE searches for certain files on the Reference Diskette whenever it runs, so although you can copy these programs with utility programs such as *The Norton Utilities* or *PC*

Tools, you must have the Reference Diskette in drive A: to use the automated IBM setup procedure.

If you have a PS/2 and want to take advantage of IBMCACHE, you only need follow IBM's minimalist instructions on an addendum sheet tucked in the binder with the Reference Diskette. Simply slide

■ Does IBMCACHE make third-party caching software obsolete, or is it just a face-saving measure?

the Reference Diskette into drive A: and type IBMCACHE, and the program guides you through the proper procedure.

The documentation is woefully inadequate, even for IBM. It tells you nothing of what the program really is or does, gives no information about its options, and is no help in manually configuring the cache.

Yet IBMCACHE works. Run the installation procedure, boot up again (so that the caching driver loads), and the PS/2's hard disk becomes noticeably more responsive.

CACHING FOR CANINES Considering some of the dogs of hard disks that IBM has seen fit to handicap its personal computers with, the initial response to IBMCACHE should be something like, "It's about time." The question is, why the sudden turnaround? Why has IBM embraced a technology that it so long ignored?

The Personal System/2 Model 50 is an answer in itself. Although IBM endowed that machine with significantly better microprocessor performance than its AT forebears, the company encumbered it with a painfully slow hard disk drive. IBMCACHE, introduced at the same time, is a partial solution to the problem. It's also either an admission from IBM that the PS/2 Model 50 drive is too slow or that caching software should have been included all along.

Whatever the reason for IBMCACHE, its devastating potential for the third-party suppliers of caching software is obvious. Why buy from someone else what IBM includes free? Heck, most people don't pay for software that IBM charges extra for—such as DOS.

IBMCACHE thus raises an important question: does it make third-party caching software obsolete, or is it just a face-saving measure for the laggardly Model 50? The PS/2s themselves demonstrate that IBM often introduces products with performance significantly below what has become standard among third-party suppliers.

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■ DISK-CACHING PROGRAMS

ers. Has IBM let this happen again with IBMCACHE?

The only way to be sure is to try out all the products in a straightforward software shoot-out. We tried IBMCACHE, and the leading third-party contenders *Flash* and *Lightning*, along with Compaq's disk-caching program and *PC Magazine's* own freebie, borrowed in updated form from a local bulletin-board system. All were installed according to their manufacturers' instructions and given the task of working through *PC Magazine's* disk benchmark tests, all on a PS/2 Model 60 under identical operating conditions.

The third-party software beat IBMCACHE on nearly every count. The after-market products not only give a better speed boost but add a multitude of desirable features. *Flash* and *Lightning* cache floppy disks, while IBMCACHE and Compaq's Disk-Cache Utility do not. Us-

■ The Compaq Cache program boasts greater cache capacity than the IBM alternative as well as the availability of more memory options.

ing some smart techniques, these programs can (in many cases) speed up disk writes as well as reads. IBMCACHE makes no attempt at caching writes. Both *Flash* and *Lightning* can be loaded and unloaded from the DOS prompt; IBMCACHE becomes a permanent fixture once it's installed.

For the most part, the type of memory used for the cache had little bearing on the performance improvement. The quantity of memory devoted to the cache altered results dramatically. You're likely to find more difference between the same program in two memory sizes than between two programs (with the same features) from different manufacturers.

Using IBMCACHE will help the per-

formance of the most laggardly hard disk. But the commercial utilities *Flash* and *Lightning* do it better all around. If you want to fine-tune your disk storage for its optimum performance, the third-party programs are still your best choice.

CACHE2

If you prefer to try disk caching at no expense other than the time it takes to install a program, Steve Holzner's CACHE program is your best bet. Originally published in *PC Magazine*, it's currently available free on bulletin board systems, often in slightly improved form.

The latest version as this article was written was called CACHE2 and bore the imprimatur of Quick and Dirty Software (no address given) in addition to a tribute to Holzner.

Compared with commercial caching programs or even IBMCACHE, CACHE2 ranks as a rudimentary effort. It caches only hard disk reads and makes no pretense of improving writing performance or the speed of floppy disks. (Strictly speaking, hard disk writes are cached, too, but are immediately written to disk; so the program offers no performance increase in writing.) However, it can speed up multiple hard disks with equal ease.

The program cannot access expanded or extended memory. It robs the RAM it requires straight from DOS in 512-byte (sector-sized) chunks and will handle between 24 and 124 sectors at a time—that's 12K to 62K bytes of RAM. The program requires 62K more memory than the sector data it buffers, about 256 bytes for the program and 6 bytes per sector for overhead.

When larger caches are needed, the CACHE2 program can be invoked multiple times to increase total capacity. Each invocation can be lent to an individual disk or may add its cache to handling all available drives. Because the individual caches are searched in reverse order of their loading, the most heavily used cache should be started last.

Because CACHE2 caches only single sectors, it works best on tasks like sorting short (under 512 bytes) database records. In fact, you will notice that the speed of loading of large files or programs will be



FACT FILE

CACHE2

Search your local BBS

List Price: Free

Requires: MS-DOS, 64K RAM.

In Short: CACHE2 caches only disk reads, but if you're looking for a free program, this is a good one.

CIRCLE 666 ON READER SERVICE CARD

largely unaffected by the cache.

Within its limitations, CACHE2 compares favorably with IBMCACHE and Compaq's Disk-Cache Utility in performance. Once you're won over by caching, however, you'll probably want to move on to a program with greater capacity and the ability to use non-DOS memory so you have enough bytes left to work with.

Compaq Disk-Cache Utility

Compaq Computer Corp. has built a business out of staying one step ahead of the competition—and one Big Blue competitor in particular. Even in so narrow a field as disk caching, Compaq not only beat IBM to the punch but packed a couple of horseshoes in its glove. The Compaq Cache program boasts greater cache capacity than the IBM alternative as well as the availability of more memory options. The Compaq Disk-Cache Utility also im-



FACT FILE

Compaq Disk-Cache Utility

Compaq Computer Corp.

2055 FM 149

Houston, TX 77070

(713) 370-0670

List Price: Included with Compaq hardware.

Requires: MS-DOS, 64K RAM.

In Short: Compaq's preconfigurable version of IBMCACHE with improvements such as support for extended memory, it still can't keep up with commercial programs in caching disk writes. Not copy protected.

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Disk intensive programs (like databases) can run 2 to 4 times faster.

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What's it like to use it? If you have ever worked with or seen a RAM Disk you know what a difference speed can make when working with any program that frequently accesses the disk. Well, **LIGHTNING**

enables those programs to approach the same rapid speed as a RAM Disk, but it does it without the disadvantages. With a RAM Disk there is a constant danger that you can lose your precious data if you forget to copy it back to the disk drive. With **LIGHTNING** you just use your programs normally. You don't have to remember anything.

LIGHTNING has a fun feature that shows you just how fast you're operating. Any time you want, with a couple of keystrokes you can see a screen that keeps a record of how many times you've accessed the disk, and how much time **LIGHTNING** has saved you. It's fun to check it out, and it's always astounding. Speed-up varies, depending on your application, frequency of disk access, and amount of RAM you can allocate. For example, best results occur with indexed databases.

When you work with a database program or most word processors, or any time you need to frequently load files into RAM or save them back, you are accessing your disk. It is such a pleasure to cut those times often in half and up to one-fourth.

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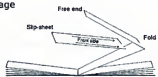
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■ DISK-CACHING PROGRAMS

proves disk writing performance substantially.

Unlike IBM, which staunchly ignores the existence of the Lotus/Intel/Microsoft expanded memory specification, Compaq embraces it with great affection. In fact, the program will execute under the Compaq Expanded Memory Manager (CEMM), which emulates EMS expanded memory in extended RAM.

From 128K to 2048K bytes of RAM in 16K increments can be allocated to the cache, limited, of course, by the memory available in the host system. In other words, the Compaq Disk-Cache Utility will work with whatever you have—providing you have a Compaq computer.

Not surprisingly, the extended memory mode of the program crashed when it was tried in the extended memory area of the IBM PS/2 Model 60. (Little wonder why Compaq lambastes the Micro Channel.)

■ *Flash* caches reads by giving the most recently used data the highest priority for lingering in memory. It also provides several ways for you to handle stored data.

The program worked well in the DOS memory area of the PS/2, however.

The Compaq program speeds up only hard disks. In some instances, such as using expanded memory made by the CEMM driver, floppy-disk performance may actually degrade when using the cache program. To avoid such slowdowns, you can switch off the cache by running it as a program with the command-line option OFF. The cache can later be turned back on or its memory cleared with other options.

To ease installation of the cache in its 80386-based computer systems, Compaq provides a menu-driven program that

takes care of all the details of setting up both the cache and the expanded memory manager.

The only problem with Compaq's cache program is that you have to buy a whole computer to get it: the utility is not sold as a separate product.

Flash

The name of the program could describe either the inspiration behind it or the way your disk drives operate once it's installed. *Flash* makes your disk drives—hard or floppy—run lickety-split. It caches both read and write operations and offers the most versatility of any caching program for fine-tuning your system.

The versatility begins with the wide variety of memory options that *Flash* affords you. You can choose either DOS, expanded EMS, or extended memory with command-line options when you load the program, DOS being the default. Shoehorn memory—extra RAM that some systems have above the 640K DOS limit that is still addressable by the 8088 microprocessor—is also compatible with *Flash*.

According to Software Masters, EMS memory can result in performance penalties when a large cache is specified, but even such degraded performance is much quicker responding than a mechanical disk.

Software Masters specifies no minimum amount of memory that can be devoted to the *Flash* cache, although 100K is recommended as a starting point for tuning your system. *Flash* will accommodate up to 3 megabytes of extended memory. If you try to allocate more memory than is available, *Flash* warns you with an error message.

Flash caches reads by giving the most recently used data the highest priority for lingering in memory. However, it also provides several ways for you to handle stored data. For instance, it will read full tracks into the cache, read files as complete blocks, or grab hold of user-designated "sticky" files that automatically get high priority in memory.

A special *Flash* option allows you to keep information in the cache permanently. After the command is given, a designated amount of the cache (up to 100K) be-

gins to fill and keeps sucking in information until the command is overridden or the reserved cache area reaches capacity. This mode is useful for keeping overlay files and compiler libraries always at hand.

Flash even lets you write the contents of its cache to disk so you can reload it later, even after you've powered down (and backed up) your PC.

Three options are available for handling disk writes. One causes all writes to go directly to disk. Another, smart writing mode, writes to the disk only when changes would be made. If a write would not result in a change, the mode is overridden. In the third mode *Flash* will optionally buffer writes for a user-defined number of seconds, stockpiling them so that it can write a full track at a time. This saves time because the read/write head need not skitter back and forth across the disk between writing the various sectors.

This last mode can also get you in trouble. If you're fast and sneaky, you can pull out a floppy disk within the delay period and lose data. The *Flash* documentation warns against using too long a delay for that reason.

When you're tired of *Flash* or you need to make room for a bulky program, the program and its entire cache can easily be unloaded from memory without rebooting. You can also suspend the caching of designated disk drives at any time or put *Flash* on hold without emptying the cache (for instance, to run uncooperative software).



EDITOR'S
CHOICE

FACT FILE

FLASH
5.0

Flash
Software Masters
6352 Gullford Ave.
Indianapolis, IN 46220
(317) 253-8088
List Price: \$69.95
Requires: MS-DOS,
256K RAM.

In Short: A feature-rich caching program with adjustable Cache sizes and support for extended memory. Still the best caching software for your money. Not copy protected.

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■ DISK-CACHING PROGRAMS

Software Masters supplies two versions, one aimed at standard IBM PCs and another a "generic" version. The former works on many compatibles; the latter makes allowances for machines that don't quite attain the 100 percent PC compatibility they may claim but may require an extra setup step.

An unusual RAM-based disk emulator is included and can dynamically vary in size, sharing memory with *Flash*. This RAMdisk works like any other DOS device and is accessed by its own drive letter, but it is faster and automatically sizes itself so that it requires only as much memory as is needed to hold the files you store in it.

Flash incorporates a copy-protection scheme that's much less bothersome than standard methods. Before the program can be run or the distribution disk copied, it must be installed. Part of the installation process encodes your name into the program; help a friend steal a copy of *Flash*, and it can be traced right back to you. (You'll want to give your real name to the installation procedure, because the protection routine generates a serial number that you need to get support from Software Masters.)

Although not quite as fast as *Lightning* for a given size of cache, *Flash* more than makes up for that deficiency with its versatility. Getting the most from your system and *Flash* will require some tinkering, but then again, that's what fine-tuning is all about.

IBMCACHE

If you've just bought a PS/2 Model 50 or better, you may have noticed a single sheet that was stuffed into your quick-reference guide along with the Reference Diskette that hints at something called IBMCACHE. If you run a directory of your Reference Diskette, you won't find the program, however.

This nearly invisible set of programs will help the hard disks of the PS/2 match the exemplary performance of the rest of the hardware. Note, however, that compared with commercial caching software, IBMCACHE only modestly enhances the writing performance of hard disks. It lacks much of the intelligence of the smart writing abilities included in the third-party



FACT FILE

IBMCACHE

IBM Corp.

Contact your local IBM dealer

List Price: Included with PS/2 Models 50, 60, and 80.

Requires: MS-DOS, 256K RAM.

In Short: IBM's attempt at disk caching principally speeds up read performance of IBM hard disks. Its poor documentation and limited options may drive you to buy a third party program anyway. Copy protected.

CIRCLE 60 ON READER SERVICE CARD

software. Note, too, that IBMCACHE has no effect on floppy disks.

IBMCACHE runs in either DOS or extended memory. Although the setup program notes a preference for DOS memory, in testing, no significant performance penalty appeared when using extended memory. Because extended RAM would otherwise be wasted—few commercial DOS applications take advantage of it—using it as a cache seems the wiser choice for most users.

To make up for the spare documentation, IBMCACHE includes a menu-driven setup program to copy the necessary files to your hard disk and add the appropriate entry to your CONFIG.SYS file. Although the setup program is a hidden system file that cannot be copied or read in a directory, it can be executed just by typing its name at the DOS prompt.

The setup program lets you choose the size of the memory cache, but it limits your options to 16K, 64K, 128K, 256K, or 384K. The limitation on your choice of cache size is imposed by the setup procedure only. Manual installation of IBMCACHE (which is totally undocumented!) allows for in-between figures.

The setup procedure also gives you your choice of "page sizes," the amount of disk that the caching program reads from the disk as a unit. The default and IBM's recommended figure is four sectors, a good choice because most hard disks (and all current IBM PS/2 hard disks) allocate clusters in groups of four sectors. The other available choices are two sectors and eight sectors.

Using the automatic setup procedure, the IBMCACHE files must be installed on drive C:. Once IBMCACHE has been installed on a PS/2 hard disk, however, its two essential files are no longer hidden and can be copied wherever you want. The automated setup will still require the Reference Diskette for proper operation, but IBMCACHE.SYS can be included just like any other device driver in its host CONFIG.SYS file, even on a floppy disk. For anyone with a little PC experience, manual installation of IBMCACHE is quite easy.

The IBMCACHE command line in CONFIG.SYS must include several optional instructions to the program. First is the number of kilobytes to be allocated to the cache. (The inadequate documentation accompanying the program does not even hint at memory limits.)

Next comes an indication of the cache's location: /NE for DOS memory (Not Extended) or /E for Extended. Finish the line with the number of sectors to use as a page, as an integer after a /P.

■ IBMCACHE includes a menu-driven setup program to copy the necessary files to your hard disk and add the appropriate entry to your CONFIG.SYS file.

The default entry in the host's CONFIG.SYS file would resemble this:

```
DEVICE=\\IBMCACHE.SYS /64  
/NE /P4
```

Although the IBMCACHE setup procedure demands the Reference Diskette and is limited to PS/2 computers to some degree, the IBMCACHE.SYS driver installed manually worked well on a PC's Limited AT compatible computer. Because of the difficulty in transferring for-

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Stan Miskowski,
BYTE, March 1987



QIC XT Turbo

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8086-1 running at 4.77 and 10MHz, 0 wait state design, speed selection from keyboard, 256K expandable to 640K DRAM, 84 key keyboard, 360K floppy drive and controller, 150W power supply, 20MB hard drive, parallel and serial port.

QIC 386-A

Basic system

80186 running at 6 and 16 MHz, 0 wait state design, speed and wait state selection from keyboard, 1MB 120ns DRAM with 64K static RAM cache, six 16-bit and two 8-bit expansion slots, 1.2 MB floppy / 84 key keyboard, combined floppy and hard disk controller, 192W power supply, system clock / calendar with battery backup.

QIC 286-12C

Basic system

80286-12 running at 8 and 12 MHz, speed selection from keyboard, 0 wait state design, 1MB 100ns DRAM expandable to 1024K, four 16-bit and four 8-bit expansion slots, 1.2 MB floppy / 84 key keyboard, combined floppy and hard disk controller, 192W power supply, system clock / calendar with battery backup.

QIC 286-10B

Basic system

80286-10 running at 8 and 10MHz, speed selection from keyboard, 0 wait state design, wait state configurable, 512K 100ns DRAM expandable to 1024, six 16-bit and 8-bit expansion slots, 1.2 MB floppy / 84 key keyboard, combined floppy and hard disk controller, 192W power supply, clock / calendar with battery backup, 2 serial and 1 parallel port.

QIC 286-QT / QIC 286-10A

Basic system

80286 running at 6 / 8 and 8 / 10 MHz, 512K DRAM expandable to 1024K, six 16-bit and two 8-bit expansion slots, 1.2MB floppy / 84 key keyboard, combined floppy and hard disk controller, 192W power supply, system clock / calendar with battery backup.

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■ DISK-CACHING PROGRAMS

mat, the availability of better programs for PC-compatible computers (as opposed to PS/2s), and the lack of a license from IBM for such purposes, using IBM-CACHE with non-IBM computers is not recommended.

Lightning

Contrary to the adage, lightning often strikes the same place more than once. If it didn't, you'd have to shuffle around the lightning rods on the barn after every thunderstorm. Similarly, the personal Computer Support Group's *Lightning* depends on repeated hits within its cache to boost the speed of your disk storage system.

Lightning is a truly intelligent caching program that can speed up any disk device in any disk operation. It works with both floppy and hard disks and attempts to optimize both reading and writing speeds.

The heart of the system is its disk read buffer, electronic storage space it steals from your system's RAM. *Lightning* makes use of either DOS or Lotus/Intel/Microsoft expanded memory specification.

In DOS memory, you have your choice of devoting 40K, 60K, 80K, or 300K to the cache. Alternatively, you can consign up to 1.8 megabytes of expanded memory to the Cache. Extended memory is off-limits. If you don't specify a buffer size or location when *Lightning* is loaded, the program defaults to the 60K size in the DOS memory range.

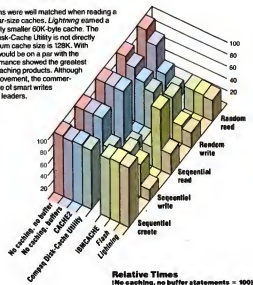
Lightning's caching algorithm keeps



Benchmark Tests: Disk-Caching Programs

(All tests were performed on an IBM PS/2 Model 60 with a 44-megabyte hard disk and a 1.44-megabyte, 3 1/2-inch floppy disk drive.)

All the disk-caching programs were well matched when reading a random sector using similar-size caches. *Lightning* earned a slight lead despite its fractionally smaller 60K-byte cache. The performance of the Compaq Disk-Cache Utility is not directly comparable because its minimum cache size is 128K. With a 64K buffer, its performance would be on a par with the others. Random-writing performance showed the greatest variation among the different caching products. Although most offered some speed improvement, the commercial programs that were capable of smart writes proved far and away the speed leaders.



Hard-Disk-Caching Tests Performance Times

(Times given in seconds)

	File Access				
	Sequential create	Sequential write	Sequential read	Random write	Random read
No caching, no buffer statements	9.54	17.31	9.16	18.37	11.58
No caching, buffers = 20 in CONF16.SYS	9.29	17.31	9.15	16.21	9.40
CACHE2 with 62K cache	9.52	17.70	9.16	13.14	4.62
Compaq Disk-Cache Utility with 128K cache (default)	9.34	9.80	1.67	11.20	2.36
IBM CACHE with 64K cache	9.35	11.43	2.84	12.52	4.24
Flash with 64K cache	9.49	9.21	9.12	5.34	4.22
Lightning with 60K cache (default)	9.43	3.21	3.13	4.66	4.06

The File Access benchmark test measures the time it takes to sequentially create and write a 256K-byte data file using record lengths of 512 bytes and 4K bytes. The test program then performs a series of operations: a sequential read of the same file, a random write, and a random read.

the most-often-used disk sectors in the buffer. It memorizes everything read from the disk and discards sectors from memory only when more recent reads crowd them out. It tenaciously holds on to directories, so it makes finding files fast.

Lightning also remembers what is writ-

ten to disk. When a write instruction is sent to the disk, the program compares it to what's in its cache. If the new write won't change what's already on your system's hard disk, *Lightning* does nothing, wasting neither effort nor time. If some change is in order or if any write is destined for a floppy



FACT FILE



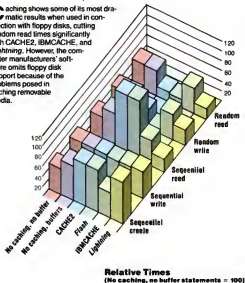
Lightning
Personal Computer
Support Group
11035 Harry Hines
Blvd., #206
Dallas, TX 75229
(214) 351-0564
List Price: \$89.95

Requires: MS-DOS, 128K RAM.

In Short: A very fast program that caches disk reads and has smart caching for disk writes. Its only failing is its lack of extended memory support.

CIRCLE 68 ON READER SERVICE CARD

Caching shows some of its most dramatic results when used in conjunction with floppy disks, cutting random read times significantly with CACHE2, IBMCACHE, and Lightning. However, the computer manufacturers' software omits floppy disk support because of the problems posed in caching removable media.

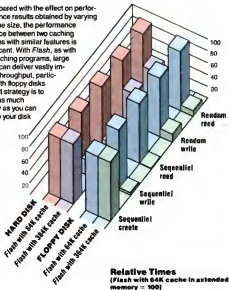


Floppy-Disk-Caching Tests

Performance Times
(Times given in seconds)

	File Access				
	Sequential create	Sequential write	Sequential read	Random write	Random read
No caching, no buffer statements	65.31	114.31	46.19	189.44	89.09
No caching, buffers = 20 in CONFIG.SYS	89.70	114.41	63.97	187.57	86.73
CACHE2 with 62K cache	108.97	114.46	108.09	130.73	33.34
Flash with 64K cache	108.92	108.42	108.04	33.34	28.45
IBMCACHE with 64K cache	65.91	114.85	46.19	189.60	89.31
Lightning with 64K cache	111.06	120.78	23.67	116.77	38.45

Compared with the effect on performance results obtained by varying the cache size, the performance difference between two caching programs with similar features is insignificant. With Flash, as with other caching programs, large caches can deliver vastly improved throughput, particularly with floppy disks. The best strategy is to devote as much memory as you can afford to your disk cache.



Changing Cache-Size Tests

Performance Times
(Times given in seconds)

	File Access				
	Sequential create	Sequential write	Sequential read	Random write	Random read
HARD DISK					
Flash with 64K cache in extended memory	9.31	9.16	9.13	5.87	4.36
Flash with 384K cache in extended memory	9.48	2.20	1.07	3.11	2.03
FLOPPY DISK					
Flash with 64K cache in extended memory	108.45	108.37	108.04	34.50	29.05
Flash with 384K cache in extended memory	108.52	3.40	1.10	4.78	2.64

disk, the write is immediately carried out.

Any or all disks in a system can be cached. Individual disks can be specified for caching by listing drive letters when loading the program. If no drives are specified, *Lightning* caches them all.

Lightning by itself does not recognize

disk drives operated by software drivers loaded in the host computer's CONFIG.SYS file. However, a special driver is supplied that links to such software drivers, enabling the program to buffer bytes to and from those devices.

In addition, *Lightning* allows any drive

to be designated as read-only and will prevent any information on its disks—or anything written to it at all—from being overwritten.

The program can detect a floppy disk change. When it does, it ignores the information from the previous disk still in the



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■ DISK-CACHING



EDITOR'S
CHOICE

• Flash

Even with the advent of IBM's new caching program, the best caching software is still the third-party variety because it speeds up not only disk reads on hard disks, but writing and floppy disks as well. Of the two most widely distributed products, Flash is the hands-down winner. Its wealth of features gives you more control to fine-tune the overall performance of your system, but most important is its ability to use extended memory, finally giving you something worthwhile to do with the extra 384K on your AT clone.

cache and frees up the buffer space that disk used.

Because all writes to floppy disk are carried out immediately, there's no chance of losing information when changing disks, but neither is there a chance of speeding up the writing.

Lightning allows caching to be turned on and off, and unloading the program frees the memory used by the cache. (This can be useful if a massive program eats all your RAM. You can switch off caching to accommodate it.) Another option provides statistics concerning how well the cache is working, comparing the number of hits (the number of sector reads found within the buffer) to misses.

With a 60K buffer cordoned off from DOS, *Lightning* proved the fastest of the caching programs tested. While *Flash* was close competition, IBMCache approached *Lightning's* performance level on only simple random reads.

Lightning's drawback is its lack of support for extended memory, the bytes that come free in so many AT compatibles (and PS/2s) that no one yet has any good use for. Were it loadable there, it would be close to a perfect product. ☐

Winn L. Rosch is a contributing editor of PC Magazine.

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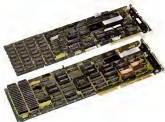
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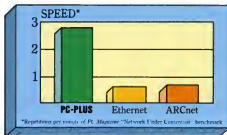
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MAKING CONNECTIONS

Integrated Multifunction Programs for LANs

●

Proponents of integrated multifunction systems are back. Their message is that if some integration is good, more integration must be better. Their campaign is for software systems with integrated word processing, database, spreadsheet, and communications program modules in one package. The idea isn't new, but the impetus driving it is.

The concept, introduced a few years ago with more fanfare than success, is that integrated multifunction systems let users move data easily among applications and use one set of menus, commands, and keystrokes throughout all operations. But despite the obvious attractions of unifying and simplifying applications with one system, people were reluctant to give up their trusty stand-alone programs, in which they had invested

LAN versions of *Enable*, *Open Access II*, and *Smart* take an all-in-one approach to networked applications.

FRANK J. DERFLER, JR., AND ROBERTO RIVERA

dollars, time, and effort. The fact that the best stand-alone applications programs could in some areas outperform the integrated packages did little to overcome users' resistance to change.

Where is the renewed enthusiasm coming from? From PC LANs, that's where. Since in many cases a new LAN must upgrade workstation software or change it to be consistent throughout the network, PC LANs, attracted by what today's integrated multifunction software offers, are breaking down resistance to change.

This time, the integration has two dimensions: integration among programs and integration among users. Multiuser access is perhaps what put the concept of integration back in the game. Double your integration, and then double your productivity.

■ INTEGRATED PROGRAMS FOR LANs

Better integration among programs and better, more powerful word processing, database, and spreadsheet modules are spurring on the move to integration. But the integration among users on LANs—where people can simultaneously share and easily exchange files created with a multifunction system—is the strongest drawing card.


We evaluated three integrated multifunction programs for use on PC LANs: Innovative Software's *Smart*, Software Products International's *Open Access II*, and The Software Group's *Enable*. You'll probably notice as you read this article that it departs from the usual format of discussing one program in its entirety, then another, and then another. Because these three systems cover so much ground, we've presented our findings in a number of ways to help you assess both features and performance.

First we give a capsule description of each of the three systems—an overall look at what each offers. We then turn our attention to all three systems' individual component programs—word processing, database, spreadsheet, and communications—to show you how they stack up against each other. The accompanying sidebar ("The User Interface: Three Approaches") examines how the three systems treat their users through the user interfaces and the documentation.


You'll also find detailed features tables for all the applications program modules, as well as timed benchmark tests for the database programs. We performed the benchmark tests on a network of IBM PC ATs operating at 8 MHz. Novell's *Advanced NetWare/286*, Version 2.0a, was the operating system on the server. The network interface cards were 3Com EtherLink cards, with a 3Com EtherLink Plus card used in the server.

Enable

The Software Group's promotional literature stresses that the company designed *Enable* as one integrated system. The system modules are a spreadsheet, a word processor, a telecommunications program, and a database. At the heart of *Enable*, a core control program manages windows and files, interfaces with pro-



FACT FILE



Enable
The Software Group
Northway 10
Executive Park
Ballston Lake, NY
12019
(800) 932-0233
List Price: Single-user version, \$695. Network version: server, \$795; each workstation, \$450 (volume discounts available).
Requires: 384K RAM per workstation; DOS 2.0 or later.
In Short: Good report generation and record locking in the database and overall high performance make *Enable* a strong contender.

CIRCLE 696 ON READER SERVICE CARD

gramming languages, and supplies macro- and menu-generating utilities for all the modules.

The core program gives the modules access to all data, eliminating the need for data transfer. *Enable*'s applications integration permits you to copy and move records, data blocks, and files between word processing windows, a spreadsheet and a word processing window, a graphics and a word processing window, and a database and a word processing or a spreadsheet window. The networked version gives multiple users simultaneous access to the same individual files and lets multiple windows open the same database at the same time.

Using the windows option, you can open up to eight files from any of *Enable*'s applications at the same time. Another significant feature of *Enable* is its password protection system, which encrypts the protected files.

If you frequently need to toggle among monitors, you'll appreciate *Enable*'s handy screen option. It lets you switch the video display setting among monochrome, 80 by 25 color, 80 by 25 black and white, and graphics, saving you from having to go to the DOS level to issue a MODE command.

Enable's start-up commands accept a variety of additional parameters to enhance system performance. You can instruct *Enable* to use memory more effi-


ciently, increase the video-display reaction speed, initiate a macro on start-up, and reduce disk switching in selected procedures.

The Profiles utility lets you establish the settings that satisfy your needs, defining printer and plotter options, screen color and text display options, and settings for all the applications.


Open Access II

Software Products International's *Open Access II* is a highly modular system. The major modules are a database, a spreadsheet, a word processor, and a communications program. The system also includes a pop-up Desk Accessories module, with appointment calendar, alarm clock, timer, address file, automatic dialer, scientific and statistical calculator, and converter for time and currency.

Open Access II's spreadsheet offers 3-D surface plots and many other powerful graphics. The communications module includes an extensive file transfer function.



FACT FILE



Open Access II
Software Products International
10240 Sorrento Valley Rd.
San Diego, CA 92121
(800) 521-3511
List Price: Complete single-user system, \$595. Single-user modules: Database, \$395; Spreadsheet with Graphics, \$295; Word processor, \$125; communications, \$125. Complete network system, \$395 per workstation (plus \$195 for Network Installation Pack, which includes desktop accessories and utilities); 10-user system with 3-sets of documentation, \$1,995; 20-user system with 6-sets of documentation, \$2,995; system unlimited by server (any number of users) with 9-sets of documentation, \$3,995. Network modules: Database, \$295; Spreadsheet, \$195; Communications, \$95; Word Processor, \$95.
Requires: 256 K RAM for single-user system, 320K per workstation for network system; DOS 2.0 or later.
In Short: A complete system that's particularly good at data sharing and has powerful graphics and communications features.

CIRCLE 698 ON READER SERVICE CARD

In some cases, however, transferring files among the modules takes a lot of work. The .DIF file format, first developed for *VisiCalc*, is the basis of the file transfers. The .DIF format is designed for numeric data, so although it works fine when moving data between the database and the spreadsheet, it's harder to use for exchanges between the word processor and the database. We ran into file format problems when moving data among applications and also when importing data from other databases that claim to output .DIF format files.

Despite *Open Access II*'s lack of polish in intermodule data transfer, the system gleams when sharing data among users. Many people on a network can use a single *Open Access II* spreadsheet, for example, simultaneously. The system automatically lets everyone see changes made by others. Similarly, the database's SQL language allows much more flexible file sharing than is normally permitted under MS-DOS.

Smart


Innovative Software's *Smart*, a system of six integrated programs—spreadsheet, word processor, database manager, communications program, calculator, and time manager—is available in modules and as a standalone PC version. A command menu and command structure unite the programs.

The *Smart* programs also share a virtual memory feature that automatically places data on the disk when RAM is filled, so creating and handling large documents and spreadsheets pose no memory overload problems.

Particularly useful in the database and communications functions, *Smart*'s complete project-processing system is, in effect, a programming language that's available throughout the modules. It can automate sequences of commands and functions by first placing a program in a learning mode, in which it records all commands and functions, and later repeating the sequence at your command. In addition, its special commands display messages on the screen, wait for user input, and perform logical (IF/WHILE) functions.

Each *Smart* module creates files in a

EDITOR'S CHOICE


FACT FILE

Smart
 Innovative Software Inc.
 9875 Widener Rd.
 Lenexa, KS 66125
 (800) GLET-SMART
List Price: Complete
 single-user system,
 \$895. Network modules:
 Database Manager, \$695; Spreadsheet with
 Business Graphics, \$495; Word Processor
 with Spelling Checker, \$395. Additional
 workstation access for system, \$395; additional
 workstation access for each module,
 \$149.
Requires: 256K RAM for single-user system,
 384K per workstation for network system;
 DOS 2.0 or later.
In Short: A powerful and intuitive integrated
 system with strong word processing and
 spreadsheet modules. Its database needs
 beefing up.
CIRCLE 667 ON READER SERVICE CARD

different format. The Send utility transfers data among modules, converting it first into the format of the target module. Although this system works smoothly, it's a less desirable substitute for transparent movement of information among the programs.

You can assign passwords to restrict access to both files and screens. If you specify a password for a file you've just created, *Smart* assigns the password to both the file and the standard screen. If you change the file password later, the standard screen password does not change with it.

The UNIX version of *Smart* allows file sharing among terminals attached to the UNIX host and PC terminals using the UNIX machine as a server.

Smart, Open Access II, Enable: THE MAJOR MODULES

The Word Processors

All three systems offer professional/corporate word processors with loads of options. The word processing features table

tells much of the story. Generally, *Smart*'s word processor is the most intuitive to use, *Open Access II*'s does the best job of sharing documents among users, and *Enable*'s imports charts and graphs from other modules best.

MULTIUSER ACCESS Each of the three systems allows many people to access a document file to read it or use it as the basis of a new document but doesn't let everyone on the network see changes as they are made. Also, if administrative safeguards are not in effect, all the systems fail to prevent the possible overwriting by one person of the changes made by someone else.

Open Access II's document file-sharing scheme incorporates at least some warning against overwriting. The first user to open the document file gains the right to save it. Anyone who tries to save the file while the first user has it open is warned that the file is locked. But after the first person quits the program, anyone else who had the file open and who has the proper rights (admittedly, this should seldom occur) can save a different version with the same name, thereby overwriting the first person's changes.

Enable and *Smart* neglect even to inform you that someone else already has the file open; anyone with the right privileges can overwrite the work of anyone else. To avoid mistakes in such wide-open programs, you have to keep files in separate subdirectories and exercise strong administrative control over shared files.

SINGLE-USER FUNCTIONS All three systems offer the usual word processing functions and some added features. To test the word processors, we created several documents with each program. We then made global changes to each document, saved specific paragraphs, merged the paragraphs into one new document, and checked the document for spelling errors. Finally, we used a mail-merge procedure that changed the address, the salutation, the closing, and all mentions of a company name from a file of four companies.

Smart's word processor earned high marks. Intuitive and fairly uncomplicated, it nevertheless handled our exercises easily, notably when reading and writing

kels, Yuppies, and you.

Software Group ... NCP

Enable 2.0	\$399.
Software Publishing ... NCP	
PF: First Publisher 1.0	59.
PF: First Choice 2.0	89.
PF: Professional Write 1.03	119.
PF: Professional File 1.01	149.
Harvard Total Project Manager 2.0	379.
Springboard ... NCP	
Newsroom Pro	45.
Symantec ... NCP	
Q & A 2.0 (database, word processor)	209.
Q & A Write 1.0	119.
Traveling Software ... NCP	
LAP-LINK 2.0 (5 1/4" to 3 1/2" and back)	79.
True BASIC, Inc. ... NCP	
True BASIC 2.01	57.
True BASIC Libraries	each 32.
Turner Hall ... NCP	
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SQL 1.1 (make 1-2-3 sheets smaller)	49.
Note-It Plus 2.0 (notes on 1-2-3 sheets)	49.
Word 1.0 (add word processing to 1-2-3)	59.
Cambridge Spreadsheet Analyst 2.02	59.
Unison World ... NCP	
Newsmaster 1.0	57.
WordPerfect Corp. ... NCP	
WordPerfect Executive 1.0	119.
WordPerfect 4.2 (one of the best)	199.
WordTech Systems ... NCP	
dBXL 1.1	89.
QuickSilver 1.1	359.
Xerox ... NCP	
Ventura Publisher 1.1	489.

EDUCATIONAL

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Algebra	32.

RECREATIONAL

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Electronic Arts (requires CGA)	
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Hayden Software ... CP	
Sargon III (Chess program)	15.
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Sphere, Inc. ... NCP

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blocks of text and checking spelling.

Variables in *Smart*'s easy-to-use merge function can be single words of up to 30 characters, delineated in text by double angle brackets. You can create a separate data file with the word processor or with the database program. The variable items are set off with quotation marks. This merge system is easy to use, and being able to manipulate the data file through the database is handy.

Open Access II's word processor is somewhat like Wang's word processor and *MultiMate*. You use the F10 key as an Execute key, and spaces entered with the spacebar appear as colored squares.

The working screen shows the name of the file, available memory, and the column, but not the line, of the cursor. Some features, including changes of fonts and text searches, are available directly from the special function keys. A ring command menu invokes other functions, such as block moves. This system works well, but the inability to use the Spacebar to move through the menu can make things awkward.

We had problems saving a specific paragraph to another file in *Open Access II*. The program has a good means of importing files into a document but not of exporting pieces of a document into a file. There is no spelling checker.

The system's mail-merge functions are called from the word processing menu and are easy to use. You enter variable fields in parentheses in the text of the document and put the substitution items, keyed to the fields in the document, in a separate file.

Enable's word processor breezed through our exercise, and the easy-to-use spelling checker worked quickly. You invoke *Enable*'s mail-merge functions from a submenu of the word processing program. A separate mail-list input form gives you an easy way to create a list of names, titles, salutations, and addresses. It creates an *Enable* database file; you can then use all the system's database functions to sort or otherwise manipulate the information.

The good word is that all three word processors are powerful and practical enough for office use. The ability of *Smart* and *Enable* to include data from their spreadsheet and database modules in word processing documents can be useful.

The Database Managers

The three systems' database programs all take different approaches and use different methods, but each has power and legitimacy. In evaluating the database modules, we compared multiple simultaneous access, report generation, project processing/query language, and import/export capabilities.

■ *Smart*'s database manager allows multiple users to add and update data in the same file.

SIMULTANEOUS ACCESS Access to the same data files by multiple users at the same time is potentially the most powerful function of networked systems. Yet MS-DOS, a single-user operating environment, has only primitive file-sharing capabilities.

Version 3.1 of MS-DOS introduced calls for record and file locking that give a user firm and exclusive use of a file or a group of records. Exclusive use includes keeping anyone else from even reading the locked data.

In some simple situations, this kind of locking is adequate. But take the case, for example, of one person updating records while another person is running a report program. If the report program tries to read a record that is being updated and is therefore locked by DOS, DOS will issue an error message. If the programmer did not include code to handle the error message (perhaps by waiting and retrying), the report program will probably crash.

Some database programs attempt to relieve the burden on the programmer by automating the DOS calls and handling "file locked" responses. *Enable* adopted this implicit file-locking approach. If an application written under *Enable* receives a "file locked" message, it continues to retry (hoping the lock will be released) un-

til it is successful or told by the user to stop.

Other database systems, like the one in *Open Access II*, work completely around DOS and coordinate their actions by using special message files, in which each program on the network posts a short description of certain types of actions before they are executed. This system is flexible and easy to use, but it adds overhead to the network, which can mean slower response times.

Smart's database manager allows multiple users to add and update data in the same file simultaneously. The program automatically locks files and records to prevent conflicts and reduce programming. When you create a file, you have exclusive access to it until you issue the Unload command. Multiple users can simultaneously execute commands that make no changes to a data file, such as queries without replace, as well as Browse, Find, and Sort (Sort creates an index file and therefore does not change the master file). Commands that change records and utilities, such as File-Fix, exclusively lock records and files, respectively.

Open Access II's database program is the only one of the three that updates globally and displays on all stations when a user changes a single record. Like *Smart*'s database manager, it supports record and file locking, but it also offers multirecord locking, which it calls list locking. The only time *Open Access II* locks the whole file exclusively is when a user modifies the file structure, such as by setting up key fields or using the File-Fix utility. The system gives you access to up to eight files simultaneously. Using virtual (disk-based) memory, it allows multiple users to share common database information without RAM limitations.

At the lowest level of *Open Access II*'s locking system, no lock is in place, and any user may change any record. There's no guarantee that the record on the screen still matches what is in the database. But if a user changes a record and someone else tries to modify the same record, a message informs the second user that someone has already updated the record. An exclusive lock locks a list of records, and only the user who issued the lock can make changes. Other users can retrieve and view the records, but they cannot change or de-

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lete them. Shared locking prevents other users from putting an exclusive lock on any of the records.

Like that of *Smart* and *Open Access II*, *Enable's* database program automatically locks records and files, allowing multiple users to access the same records and files without destroying each other's work. When doing a find or sort, *Enable* creates a file called a select set—a temporary file with pointers to records that lack database definitions, indexes, and permanent names (in other words, a temporary group of records that meet certain conditions). A select set has the same name as the database file with the extension .SS. Although the select set filename is the same for all users, each user's select set is distinct. Each user has one select set for each of the data files, allowing a number of different users to work on the same database file in the same directory at the same time.

REPORT GENERATION The ability to generate reports is a major attraction of database programs. Some report generators use a fill-in-the-form approach to help users format raw data into printable reports. Others rely on lists of options, and still others provide visual representations of the finished report.

Smart has two different commands that generate output. You can use the print command to send a straight copy of the records in a file to the screen or printer in either list or column format. For more customized reports, you can also use the report command to set up the kind of report to be printed and the general features of the page layout.

Open Access II has a print form, which determines the report layout and any additional text and expressions. The report generator offers the usual assortment of report options such as header and footer text, formulas, and totals and subtotals. You can use the print form with a query model to generate a report of records that meet certain conditions.

Enable generates three types of reports. The columnar report is a quick and simple way to retrieve and print database records. You specify the database file to use, whether to use an index, and whether to direct the report to the screen, disk, or printer. For more-sophisticated reports and for-

matted reports, the Put It Here report form creates a form file defining the overall page layout, field positions and labels, and field attributes (picture and format). You can include fields from other databases, calculated fields, or system fields (such as time and date). Defining your first Put It Here report requires frequent references to

■ *Open Access II's* query capabilities can access and join up to eight files simultaneously.

the manual. After that, creating the report becomes as fast and easy as with *Smart's* report function. The third type of report is the procedural language report, designed as a word processing document using dot commands (similar to *WordStar's* dot notation).

PROJECT PROCESSING As powerful as modern report generation utilities are, some reports are best written in a higher-order language, with tools that can format outputs better and with direct programming to handle the job more efficiently.

Smart's project-processing functions create and execute project files. A project file is a set of commands that performs some predetermined activity, in the same way as a DOS batch file. The flexible, powerful *Smart* programming language lets you execute all the commands within the data manager command menus and includes high-level programming constructs such as IF/THEN/ELSE, JMP instructions, input/output, and procedural processing commands. It also has a menu generator.

The query language *Smart* uses is simple compared to Structured Query Language (SQL), which *Open Access II* uses. The *Smart* database has only a handful of query commands, limited to single-file operation. To perform multiple-file queries,

you must first link each file and define a relation with another file (only two files can be linked at a time) to create a third file. Relating (called "joining" in *dBASE III*) two relatively large data files can take many hours. Working with multiple files requires extracting the needed fields from each of the appropriate files and joining them in a newly created file. The process is inherently inefficient; it's slow and uses a lot of disk space.

Smart has a couple of handy multiple-file processing capabilities. The Lookup command defines a relationship that causes data from a different file to be automatically entered into the current file when records are being entered or updated. The Transactions command defines a relationship between two files that causes a field from one file to be added, subtracted, or moved to a field in another file. The transaction takes place after the records have been entered or updated.

Open Access II's SQL has powerful, flexible query capabilities. It can access and join up to eight files simultaneously. Better still, it eliminates the setup time for generating reports. Linking and defining relations between files to run our tests took a long time with *Smart*, but with *Open Access II* it was simply a matter of defining the query and typing it in.

With the *Open Access II* Programmer utility, you can write programs that access database files and manipulate the information. The utility makes it easy to create user-friendly database applications programs with pop-up windows, system menus, and context-sensitive on-line help. The fact that every sort or index field must be a key field results in fast queries and searches, but more disk space may be required to store the application.

Enable has no query language. Instead, it has a set of commands that manipulate records and fields in one database file (such as Find, Display, Browse, and Sort), copy part or all of one or more records from one database into another without having to rekey those records, and combine some or all of the fields from two databases into a new, third database with a longer record length. In search operations, *Enable* lets you specify wildcard characters in the WHERE clause.

Enable's procedural language is intend-



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Network Support

NETWORK	Enable	Open Access II	Smart
Alloy PC-Plus with PC-Slave/16 NTNX option	Not tested*	<input type="radio"/>	<input checked="" type="checkbox"/>
AT&T StarLAN	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
AST PCnet	Not tested*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Banyan Network Server with VINES	Not tested*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Corvus Omninet	Not tested*	<input type="radio"/>	<input checked="" type="checkbox"/>
Fox 10-NET	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Gateway G/NET	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
IBM PC Cluster	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
IBM PC Local Area Network	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
IBM Token-Ring Network	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Multiblink Advance 3.03	Not tested*	<input type="radio"/>	<input checked="" type="checkbox"/>
Nestar PLAN 2000	Not tested*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Novell S-Net	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Orchid PCnet	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Proton ProNET-10	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SMC ARCnet	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
System 5000, 6000 (Sytek)	Not tested*	<input type="radio"/>	<input checked="" type="checkbox"/>
3Com EtherLink	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TI-EtherLink	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Torus Tapestry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ungermann Bass Net/One	Not tested*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
VistaLAN PC	Not tested*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Telecommunications Features

PARAMETERS	Enable	Open Access II	Smart
Predetermined parameters	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rate settings (bps)	119-9,600	119-9,600	119-9,600
Full duplex	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Half duplex	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Turnaround character	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
XON/XOFF flow control	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Time-out setting	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Max. no. of retry settings	10	100	99
DATA HANDLING			
Standard AT command set	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Hayesextended command set	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RS-232 lines supported	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RS-232 lines required	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
Translates outgoing data	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
Translates incoming data	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
Filters outgoing data	<input checked="" type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>
Filters incoming data	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Telecommunications Features

DIALING	Enable	Open Access II	Smart
Manual dial	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Auto-dial/auto-log-on	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Max. no. of repeat dials	99	999	9,999
FILE TRANSFER			
Formats accepted	Checksum, Xmodem, Kermit, Enable	ASCII, Xmodem, Kermit	ASCII, Xmodem, Parity
Background file transfer	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Simultaneous two-way transfer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
REMOTE FUNCTIONS			
Runs programs remotely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remote file transfer	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Remote transfer through batch files	<input checked="" type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>
DOS FUNCTIONS			
Exits to DOS w/o breaking connection	<input checked="" type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>
DOS functions included	<input checked="" type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>
Access to DOS level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PASSWORD PROTECTION			
Single password	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Different passwords for different users	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
Stores password	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CUSTOMIZATION			
User-defined menus	<input checked="" type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>
Macros	<input checked="" type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>
Script language	<input checked="" type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>
TERMINAL EMULATION			
	DEC VT-52, DEC VT-100, AT&T 4410	DEC VT-100, TTY	DEC VT-52, DEC VT-100, Dumb, ANSI
OTHER			
On-line help	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Command type	Menus	Pop-up windows	Menus
Memory-resident mode	<input checked="" type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>
Built-in text editor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Word Processing Features

DISPLAY	Enable	Open Access II	Smart
Filename	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Disk designation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Directory	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Time/date	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Screen size (lines × characters)	23 × 78	72 × 20	25 × 80
Automatic word wrap	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Disables word wrap	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
No. of windows	8	None	50
EDITING			
Automatic reformat	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Manual reformat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deletes word	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

* — Indicates Editor's Choice ● — Yes ○ — No

*The LAN version of Enable is a new product and has not been tested with every LAN combination. However, it uses standard DOS file and record locking and should work on any network that supports standard DOS calls.

Word Processing Features

EDITING	Enable	Open Access II	Smart
Deletes line	●	●	●
Deletes sentence	●	●	●
Deletes paragraph	●	●	●
Deletes page	●	●	●
Deletes document			
Hyphenation	Alter case, hard/soft, hard	Soft, hard	Hard/soft, hard
Moves cursor to next/previous:			
Character	●	●	●
Word	●	●	●
Line	●	●	●
Sentence	●	●	●
Paragraph	●	●	●
Screen	●	●	●
Page	●	●	●
Moves cursor to beginning/end of:			
Line	●	●	●
Sentence	●	□	□
Paragraph	●	□	□
Screen	●	●	●
Page	●	□	□
Document	●	●	●
Jumps cursor to:			
Character	●	●	●
Line	●	●	●
Page	●	□	□
Place marker	●	□	●
Scrolls	Up, down, right, left	Up, down, right, left	Up, down, right, left
BLOCK EDITING			
Character	●	□	●
Word	●	□	●
Line	●	□	●
Sentence	●	□	●
Paragraph	●	□	●
Vertical block or column	●	□	□
Page	●	□	□
From cursor to end of file	□	□	□
From cursor to beginning of file	□	□	□
Moves block	●	●	●
Copies block	●	●	●
Swaps block	□	□	□
Deletes block	●	●	●
COPIES DELETES TO			
Buffer	●	□	●
Disk file	●	●	●
Text macros	●	□	□
SEARCH-AND-REPLACE			
Forward	●	●	●
Backward	●	□	●
Case-sensitive	●	□	●

Word Processing Features

SEARCH-AND-REPLACE	Enable	Open Access II	Smart
Searches on wildcard	●	●	□
Replaces on wildcard	●	●	□
Verifies replace	●	●	□
UNDO			
Undoes last delete	●	●	●
Undoes last edit command	□	●	□
FORMATTING			
On-screen formatting	●	□	●
Proportional spacing	●	□	□
Bold	●	●	●
Italic	●	●	●
Underline	●	●	●
Superscript	●	●	●
Subscript	●	●	●
Strike-through	●	●	●
Headers and footers	●	●	●
Multiple columns	●	●	□
PRINTING			
Printers supported	Over 50	66	40
Customizable printer codes	□	●	□
Inserts codes in text	●	●	●
Specifies sheet feeders	□	□	□
Edits while printing	●	□	□
Queues files	●	□	□
Merges files for printing	●	●	□
Pauses to change print wheel	●	●	●
Envelope formatting	□	□	□
FILE HANDLING			
File type	Enable format, Memory-dependent	ASCII	ASCII
Max. document size		32K	Hardware-dependent
File merge	●	●	●
File import	IBM RFT/DCA, WordStar MAY/DIE, Peachtree, Volkswriter, EasyWriter, MultiMate	WordStar ASCII	WordStar IBM RFT, ASCII
File export	Same as import	WordStar	None
SPECIAL FEATURES			
Spelling checker	●	□	●
Thesaurus	□	□	□
Macros	●	●	●
Style sheets	□	□	□
Footnotes	●	●	●
Automatic indexes	●	□	□
Automatic table of contents	●	□	□
Graphics in text	●	□	□
Foreign-language support	●	●	●
Scientific notation	●	□	□

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Word Processing Features

SPECIAL FEATURES	Enable	Open Access II	Smart
Outline generator	●	○	○
Math functions	●	●	●

Spreadsheet Features

WORKSHEET PARAMETERS	Enable	Open Access II	Smart
Max. columns × rows	255 × 255	216 × 3,000	999 × 999
Rows on-screen	20	18	18
Characters on-screen	72	78	70
Max. column width (characters)	72	72	80
Max. no. of characters per cell	72	255	99
Max. no. of characters in a range name	15	9	16

DATA MANIPULATION

Can enter cell contents with arrow keys	●	○	●
Undoes complex commands	●	●	●
Single-stroke Ready command	●	○	○
Recalc order by row, column, logical order	●	●	●
Error recovery	○	○	○
Pointing	●	●	●
No. of strokes to blank a single cell	2	2	1
Cell protection	●	●	●

DISPLAY FEATURES

Titles	Horiz., vert.	Horiz.	Vert.
CapsLock, NumLock, etc.	●	○	○
Date and time	○	○	○
High-bit ASCII characters	●	●	●

SPLIT SCREENS

Maximum number	8	6	50
Independent scroll format	●	●	●

HIDE DATA FEATURES

Columns and rows	●	●	●
Individual cells	●	●	●

MULTIPLE WORKSHEET FUNCTIONS

Merges worksheets	●	●	●
Adds/subtracts worksheets	●	●	●
Multiplies/divides worksheets	○	●	●
Joins edge to edge	●	●	●
Saves partial spreadsheet	○	○	○
Warns against file overwrite	●	○	●
Displays formulas in worksheet	●	●	●

MACRO FEATURES

Learn mode	●	●	●
Runs 1-2-3 macros	●	●	●
Macros reside in worksheet or macro library: W/ML/Both	W	Both	ML
Context-sensitive help	●	●	●

Spreadsheet Features

FILE TRANSFER	Enable	Open Access II	Smart
Imports 1-2-3, dBASE, dIF	●	●	●
Exports 1-2-3, Symphony, dIF	●	●	●

GRAPHING

Number of graph types	6	9	10
Prints directly from screen	●	●	●

CUSTOMIZATION

Built-in hardware reconfiguration	●	●	○
Changes screen colors	○	○	●
Displays numbers as words	○	○	○
Definable file extensions	●	●	●

NUMBER OF FUNCTIONS

Total	97	63	212
Math	34	22	95
Logic	8	11	10
Finance	6	2	16
Date	24	11	32
Statistics	7	8	21
Other	7	9	13

OTHER

Uses sparse memory matrix	●	○	●
Expanded memory support	○	●	●
Math chip support	None	8087/287	8087/287

Database Features

	Enable	Open Access II	Smart
Database type	Relational	Relational	Relational
Command type	Menu-driven	Menu-driven	Menu-driven
Application generator	●	○	○
Menu generator	●	○	○
On-line help	●	●	●
Mouse support	●	●	○

FILE STRUCTURE

Field size	254	78	1,000
Max. no. of fields per record	254	100	255
Max. record size	64,517 characters	2,048 bytes	999,999 characters
Records per database	65,000	2.2 billion	Dependent on storage

INPUT

Prompts messages for input	●	●	●
Screens per file	Memory-limited	Memory-limited	10

DATA TYPES

Character	●	●	●
Date	●	●	●
Time	●	●	●
Fixed-point decimal	Integer	Integer	○

—Indicates Editor's Choice ●—Yes ○—No

Database Features

DATATYPES	Enable	Open Access II	Smart
Floating point	●	●	●
Range testing	●	●	●
Default values	●	●	●

FIELD ATTRIBUTES

(Automated, Programmable)			
Range testing	A, P	A, P	P
Default values	P	A, P	P
Requires specific values	P	A, P	P
External look-up	P	A	P
Double entry verification	P	A, P	None
Required fields	P	A, P	P
Must-fill field	P	A, P	P
Forced uppercase	P	A, P	None
Date conversions	P	P	P
Incrementing fields	P	A	P
Unique fields	A, P	A	None
Automatic data entry	P	A, P	P
Calculated fields in form	P	A, P	P
Carryover	None	A, P	None
Error handling	A, P	P	None

DATA MANIPULATION

Indexing (fields)	10	100	16
Compound indexes	○	●	●
Index values must be unique	●	●	○
Can respecify indexed fields	○	○	○
Can respecify file definition	○	●	○
Multiple record deletions	●	●	●
Multiple record updates	●	●	●
Math updates	●	●	●
Text updates	○	○	○
Table merging	○	○	○
Max. no. of open files	Memory-dependent	8	50
Sorts on unindexed fields	●	○	●
Sorts in ascending order	●	●	●
Sorts in descending order	●	●	●

QUERY FEATURES

Query language	●	●	●
Multiple file access	●	●	○

SEARCH PARAMETERS

First occurrence	●	○	●
All occurrences	●	●	●
Index field only	○	○	●
Multiple fields	●	●	●
Case-sensitive	○	○	○
Whole word	●	●	●
Range	●	●	●
Phonetic searching	○	○	○
Boolean	AND, OR, NOT	AND, OR, NOT	AND, OR, NOT

Database Features

MACROS	Enable	Open Access II	Smart
Automatic recording	●	●	●
Keystroke macro	●	●	●
Macro language	●	●	●

REPORTING

Multi-file reports	●	●	●
Breakheads	●	●	●
Page breaks	●	●	●
Date arithmetic	●	●	●
Exponential functions	●	●	●
Trigonometric functions	●	●	●
Financial functions	●	●	●
Totals	●	●	●
Subtotals	●	●	●
Average	●	●	●
Count	●	●	●
Maximum	●	●	●
Minimum	●	●	●
Screen painting	○	○	○
Forms duplication	○	●	○
Automatic report define	○	○	○
Predefined mailing labels	●	○	○
Report programming	●	●	○
Stored report definitions	●	●	●
Headers	●	●	●
Footers	●	●	●

OUTPUT

Printer setup	●	●	●
Output to screen	●	●	●
Output to file	●	●	●
Output to printer	●	●	●

FILE TRANSFER

Import	DNF, DBF, SYLK, WKS, ASCII	DNF, DBF, WKS, ASCII	DNF, DBF, SYLK, ASCII
Export	DNF, DBF, SYLK, WKS, ASCII	DNF, DBF, WKS, ASCII	DNF, DBF, SYLK, ASCII

DOS SUPPORT

DOS subshell	●	○	●
DOS command subset	●	○	○
Change default directory	●	●	○
Access from other directory	●	●	●

HIGH-LEVEL INTERFACE SECURITY

Field	○	○	○
Record	●	●	○
File/segment	●	●	○
Database	●	●	●
Data encryption	Proprietary	Proprietary	None

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THE USER INTERFACE: THREE APPROACHES

In their overall structure and the way they work, *Smart*, *Open Access II*, and *Enable* follow the standard, state-of-the-art practices in the software industry. And since they look and feel like many other PC-based products, you can put your fears of extensive training needs and unusual user resistance aside.

But the way each system accommodates users' needs—through its user interface and documentation—is an important consideration in making a purchase decision. Here's the word on their user interfaces and documentation.

LIKE A MENU? Each of the systems takes a different approach to the user interface, but they all achieve similar results.

Smart uses the ring menu setup popular in spreadsheet programs. The cursor highlights selections that are explained on a lower line. You select commands by using the cursor or by entering the first letter of the command. The Spacebar, not the cursor keys, moves the cursor in the menus. Several command lists are available.

More-advanced users of *Smart* can use the Quick Keys, usually function keys or a two-character key sequence. They allow you to bypass several levels of menus and execute instructions with fewer keystrokes. *Smart* has a default set of Quick Key definitions, and you can create your own.

In addition, *Smart's* macro capabilities let you redefine nearly every key sequence on the keyboard. A macro key definition can consist of up to two full lines of characters. *Smart* treats macros as regular files with a file name of up to eight alphanumeric characters with an extension of .MC3. You can create macro definitions, save them, load them in memory, and edit, view, and execute them.

Unlike programs that require you to remember the names of index, screen, report, and data files, *Smart* automatically lists the valid filename choices in a

window. You use a moving arrow to choose a file from the window.

Open Access II, on the other hand, greets you with a pull-down menu that you scroll through using the cursor keys. The initial menu doesn't explain the choices, but, as all the system's menus do, it gives you hints in angle brackets at the bottom of the screen. One welcome feature—hitting the Esc key takes you back to the main menu.

Open Access II does not display relevant filenames automatically, but when you press the designated search key, it will show you a list of index, screen, report, and data files.

Enable uses nearly the same ring menu format as *Smart*, except that the command lines of the initial menus start high on the screen and stay there as you work through the menus. They serve as visual maps of how you got to a particular function and how far you have to back out by using the Esc key. You can highlight selections by using the Spacebar or the cursor keys.

Inside the individual programs, *Enable* uses a top-line ring menu, which you invoke with the F10 key. The menu gives you easy access to the program's functions.

You can enter commands in two ways: through the ring menu or through "expert commands" (three-key sequences initiated by pressing the F9 key followed by two other keys in sequence). You can view relevant filenames by pressing a search key. Some predefined Ctrl- and Alt-key sequences can also execute commands. *Enable's* macro capabilities, like *Smart's*, let you redefine any key sequence.

FUNCTION IS KEY All three programs make extensive use of the function keys. They all also follow the convention of using the F1 key as the help key.

The *Smart* function keys work consistently among the programs. *Smart* comes with keyboard templates for every user, which fit next to the function keys on the

left of the PC and 6-MHz AT keyboard.

The *Open Access II* and *Enable* function key commands aren't as consistent throughout the modules as *Smart's*. *Enable's* quick reference guide is of limited value, and we received no templates or quick references for *Open Access II*.

Smart and *Enable* have multilevel help screens that offer a series of choices. *Smart's* highly detailed screens include an index to the material contained in the help files. *Open Access II* uses a split help screen, with the keys defined at the top and context-sensitive text displayed at the bottom. These screens generally answer questions faster than *Enable's* and *Smart's* screens do. Although all three help systems are effective, some take longer and require more effort; *Enable's* system, for example, often requires you to work through two or three menu choices before it answers you.

All three programs make good use of color screens. On monochrome systems, *Smart* and *Enable* rely mainly on reverse video to display special menus and messages. *Open Access II* makes extensive use of highlighted video—an effective system but one that requires careful adjustment of the monitor.

PUT IT IN WRITING *Smart* sets the standard for both documentation and tutorials. Its helpful, complete user aids proved indispensable in implementing the database script files. Each command is accompanied by a step-by-step explanation that eliminates guesswork.

Open Access II's documentation and tutorial help you enough, but are harder to understand than those of *Smart*.

Enable's sample applications and user manuals are a combination reference guide and booklet-form tutorial. The system also has an on-line tutorial. The manuals include handy quick-reference guides. Some of the manuals, particularly the one for the communications module, are excellent, but *Enable's* tutorial is less detailed than that of *Smart*.—Frank J. Derfler, Jr., and Roberto Rivera

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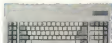
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ed for designing report forms as word processing documents. This language uses dot commands (similar to those of *WordStar*'s mail-merge) to define the report layout and features. The report definition section contains definitions of local fields, the body section describes where and how the data in each record will be printed, and the map section begins the form design.

The procedural language can accept commands entered in input from macros to look up data from another database, perform conditional (IF/THEN) testing to control the flow of the input form, update a related database with information keyed into a record, and establish a link between two databases while working on report forms and input from macros. Like most procedural languages, it takes time and effort to learn, but the payoff in flexibility is worth it.

FILE IMPORT/EXPORT Disk storage limits are a constant worry when reading or writing networked database files. *Smart* helps avoid disaster by informing you when an import or export operation has been aborted because of lack of space. Unfortunately, you cannot continue importing or exporting from the point at which the process was aborted. You must start again—a major inconvenience when you are working with large files.

Smart has two categories of file transfer. The first is between two *Smart* applications programs. This type of file transfer executes the send command, automatically unloads all active files, and transfers the data; the receiving program then takes control. The database manager imports files in comma-delimited ASCII format, *dBASE* format, or a fixed-length field format. It exports in *Smart*, .DIF, ASCII, Text, and M-SYLK formats.

Importing .DBF files into *Open Access II*'s .DF database file format is a frustrating experience. When importing files, *Open Access* creates a temporary "&" file (the filename begins with an ampersand). This file grows as large as the original .DBF file. Therefore, importing a 7-megabyte .DBF file and converting it into an *Open Access* .DF format requires 21 megabytes of disk space. The process is also slow. As in *Smart*, when disk space runs out, you must start the whole process from scratch.

When importing .DBF files, you can convert them to .DIF format or import them directly to an *Open Access II* applications program file format, in which case you don't have to predefine the file structure. The import utility creates the file definition automatically with the same field and record structure as the source file. A

■ Although they differ appreciably, the database programs of the three systems are all powerful and legitimate in their own ways.

handy feature of the utility is its visual verification of the file conversion.

After the tedium of importing the data files into the database formats of *Smart* and *Open Access II*, *Enable*'s complete compatibility with *dBASE III*'s .DBF files was a welcome feature. Importing the largest files took under 3 minutes. *Enable* can also import and export *PC-File III* and *Condor 3* files.

MORE FEATURES, ONE PROBLEM

Finally, some additional features, and one significant problem, of the three systems merit attention.

Open Access II allows you to set up virtual names or paths to different subdirectories. You can thus partition, for example, inventory files from the engineering files. Each partition gets a volume name and a corresponding DOS drive and subdirectory.

Smart takes the precaution of preventing you from modifying the structure of a file, even if the file is empty. Having lost *dBASE* data while restructuring files, we applaud this feature. But it would be useful and practical to allow file and record restructuring as long as the file is empty.

Enable is a bit more forgiving than *Smart* or *Open Access II*; it lets you modify the database definition before and after re-

cords are added. Frequently the original database definition cannot accommodate all the data to be added to the database or all of the ways you want to work with the data. In *Enable*, revising a database definition after adding records may make records incompatible with the definition. In such cases, *Enable* displays an error message on the status line and asks whether or not to use the existing records with the modified definition. If you respond yes, a transfer form will automatically copy records to the revised database.

Enable gives the database administrator housekeeping tools to make backup copies, use a backup version of a database to replace a damaged database, and modify databases by deleting or destroying records. The archive utility copies deleted records to a storage file. The backup command makes a copy of a database, its definition, and all associated index files. You cannot access the backup file directly, but you can record it using the Restore command. This utility offers a convenient way to transmit the entire database to another location.

Now for that significant problem: Because *Open Access II* and *Enable* cannot import comma-delimited ASCII files, we had to translate our benchmark files into the .DBF format (accepted by *Open Access*) using Ashton-Tate's *dBASE III*. After translation, we used the same files with *Enable* and with *Open Access II*. *Open Access* would not index our 7-megabyte data file; it returned a "Data Base Corrupted" error. But *Enable* used the same file without a problem.

The technical support staff at Software Products International acknowledged the problem and stated that it had been corrected. They used an unreleased version of the program to index the file so that we could complete the tests. Since indexing was not a part of the timed test, we used this file to complete our testing.

Although they differ appreciably, the database programs of the three systems are all powerful and legitimate in their own ways. The *Smart* database program is flexible, but developing some relational functions can take a great deal of time. The SQL programming language in *Open Access II* gives that database tremendous power, but SQL is not a simple language to

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use. (Also, make sure the problem we encountered has been corrected in your version of the program before you use it with a large database.) The *Enable* database program has a powerful programming language and an easier-to-use query facility.

The Spreadsheet Programs

Each of the three systems has a spreadsheet program that is the equal of the most advanced standalone programs on the market. The spreadsheet features table describes the capabilities of each product in detail. While the *Smart* spreadsheet seems to have the most features, the *Open Access* program has some that are unique. And the *Enable* spreadsheet has one feature that could become a liability.

MULTIUSER ACCESS Several things are possible on a true networked spreadsheet that are impossible on the standalone equivalent. *Open Access II*'s networked spreadsheet program allows people at different workstations to work on different areas of the same spreadsheet at the same time. Within the limits of a 640K-byte system, only a few practical applications will fit into a workstation already crammed with networking and multifunction software, but with new versions of DOS promised and extended memory systems available today, putting an entire accounting system for a small business into one spreadsheet becomes practical.

In certain shared-access modes, everyone sharing the same spreadsheet can see changes made by others as they occur. The first person loading a particular worksheet in *Open Access II* is asked whether that spreadsheet should be made available to others. Specifying the exclusive mode restricts access and also speeds up performance.

When placed in shared mode and used by more than one person, an *Open Access II* spreadsheet concurrently reflects changes made to the worksheet on all the screens of the workstations using the same worksheet model. Speed decreases as more stations access the same worksheet. In shared mode, a user can lock up to eight different areas in a worksheet model to accept his changes only, on a first-come-

first-served basis. Structural changes to the worksheet model, such as inserting or deleting rows and columns, are not possible in shared mode. The locking feature affords some protection but can also prevent other users from performing what-if analyses on the locked information.

The *Smart* spreadsheet has limited multiuser capabilities. It can run on a standalone basis or centrally from a network file server. Only the first user to load or activate the file can save it under its current name. After the spreadsheet is loaded, it

■ *Enable*'s graphics applications program lets you create charts and graphs directly from information in the spreadsheet or database.

works in a single-user mode. People using the same spreadsheet don't see the changes made by the others. When subsequent users load the same worksheet, a warning message is displayed indicating that the worksheet is already in use. Subsequent users must save the worksheet under a different name.

Smart manages this process by creating a temporary file with the extension .W\$\$ whenever a worksheet file is loaded. The presence of this file indicates that a worksheet file of the same name is in use.

Password protection bars unauthorized users from using the spreadsheet. A second level of protection is provided by the lock command, which protects cells and groups of cells in the current worksheet by disallowing changes to their contents. Only the person who issued the lock command can modify the contents of the cells or unlock them, but anyone can view the worksheet's contents. The third level of protection is the protect command, which is designed to prevent other users from

editing or viewing protected formulas.

Enable doesn't allow multiple simultaneous access to the same spreadsheet. You can copy a spreadsheet into another subdirectory and use the copy, but only one person at a time can access a spreadsheet file.

CONFIGURATION The *Smart* spreadsheet has a maximum size of 9,999 rows by 999 columns. It requires at least 384K-bytes of memory at each workstation, uses virtual memory management techniques, and supports 8087 and 80287 math coprocessors.

The *Smart* spreadsheet display screen can be custom configured in several ways. Menus, borders, and column and row numbers can be displayed. You can customize margins, the colors of the borders, the cursor, the formula and locked cells, the windows, and the foreground and background. You have an additional choice for the font types displayed on the video monitor.

The *Open Access II* spreadsheet program has a maximum grid size of 216 rows by 3,000 columns. A worksheet model can have up to six active windows displayed concurrently, linked horizontally and/or vertically. You can expand or contract the windows.

The printing support of the *Open Access II* spreadsheet is similar to that of *1-2-3*, with the option of either printing the worksheet as is (with headers, footers, page numbering, and margin formatting optional) or printing the formula entry of each cell. *Open Access II* adds a third option, which it calls cross-reference. Printing by cross-reference produces a list of the cells containing specified expressions referring to that cell.

Open Access II has a convenient way to answer multiple what-if conditions in a table form. You specify a range of values for an independent variable, and the program calculates the corresponding values for a number of independent variables.

Enable's Global Dimension command adjusts the shape of the spreadsheet to the users' needs. You have six options to choose from. The default size is 255 rows by 255 columns. The other options are 511 by 127, 1,023 by 63, 2,047 by 31, 4,095 by 15, and 127 by 511. You can reshape the spreadsheet any number of times.

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The *Enable* Hilite command lets you highlight all of the cells that refer to a specified cell. It's especially useful when you're considering changes and you want to know what cells the changes will affect.

FEATURES The spreadsheet system in *Open Access II* has data management routines that include defining, entering, and retrieving data from a database inside the spreadsheet; performing queries on the database; and sorting, listing, finding, and joining records in the databases.

Smart lacks data management features in the spreadsheet. But you can use its full-power database program to manipulate spreadsheet files.

A convenient feature of the *Smart* spreadsheet gives you access to DOS from within the spreadsheet when you type Ctrl-O. Typing EXIT at the DOS prompt brings you back to the spreadsheet. Another nice feature is the F-Calculator, which tests the accuracy and validity of formulas before entering them into a worksheet. It can also perform calculations unrelated to your worksheet.

The *Open Access II* spreadsheet has a handy mail-merge and calculation-merge capability. The mail-merge is functionally similar to *WordStar's*, which merges a form letter with records from a database to generate a separate letter for each database record. Calculation-merge is an extension of mail-merge, allowing for the calculation of values to be used in the generated documents.

Another helpful feature of *Open Access II* is its goal-seeking capabilities. You can specify goals, or target values, for one or more dependent variables. The program calculates the values for the independent variables needed to achieve those goals.

If you are comfortable using 1-2-3, you'll find *Enable's* spreadsheet easy to use. The difference is the ease with which you can bring in text or database files from *Enable's* other applications modules.

On the downside, the *Enable* spreadsheet builds big files that could seriously limit the amount of data you can put into a spreadsheet. According to the technical support staff at The Software Group, the spreadsheet module builds an index of formulas so that only the formulas involved in a change have to be recalculated. They say

this provides fast recalculation, but it results in the creation of large files in spreadsheets that are heavy on formulas. In our tests, *Enable* built a file of nearly 250K bytes for a relatively small amount of data. In fact, we had to cut our standard test down to one-quarter its normal size so the spreadsheet could be loaded on a workstation with 640K bytes of RAM.

You can go to DOS from *Enable's* spreadsheet through the DOS facility, but you must specify a memory allocation parameter on start-up, telling *Enable* how much of the computer's RAM to use and leaving the remainder free for the DOS commands when the DOS window is used.

MACROS Since the macro command structure of 1-2-3 has evolved into a programming language, the ability to use macros, particularly 1-2-3 macros, is important.

Smart's spreadsheet macros differ from the standard 1-2-3 macros in their use of menu-driven macro definition and manipulation. The macro feature can redefine almost any key on the keyboard to output an alternative series of characters (including Ctrl-key and Alt-key combinations). The macro key definition can be up to two lines of characters. Unlike 1-2-3 macros, which are entered with the worksheet file, *Smart* spreadsheet macros are stored individually as separate files with .MCI extensions on the current data file. Macro definitions behave like regular files—you can define, clear, load, remove, view, and save them.

Open Access II's spreadsheet macro utility is both more primitive and more advanced than 1-2-3's macro facility. It's more primitive because in 1-2-3 you can give macros one-letter names, but in *Open Access II* you must remember the starting cell number of the macro definition to execute the macro. It's more advanced because you can set it up so that the macro is executed automatically when you select the spreadsheet model.

Enable's macros follow the same definition and naming convention as 1-2-3 macros. You can define macros within a range in the spreadsheet and name them with a backslash (\) and a single-character identifier. To execute a macro, you press

Shift-F9 (1-2-3 uses Alt-F9) and type the identifier.

During the execution of an *Enable* macro, a command to open a window or go to another window will cause the macro to stop until the file containing the macro returns to the active window. Naming a macro definition as \O causes the macro to be executed automatically when the spreadsheet that contains the macro is displayed on screen from the main menu.

Despite the similarities between *Enable* and 1-2-3, you may need to edit 1-2-3 macros before using them in *Enable*. *Enable* eases the conversion by checking for macros in a 1-2-3 worksheet and translating the ones it has equivalent commands for. It highlights cells with invalid macro commands or errors (or keystrokes that *Enable* interprets as errors). When executing the macro, it highlights cells containing errors, such as syntax errors.

FORMULAS AND MATH A unique feature of the *Smart* spreadsheet program is its capability for matrix mathematics on worksheet blocks. Some matrix functions include inverting a matrix, regression, transposing, and creating eigenvalues and eigenvectors.

The formula editor makes it easier to deal with long formulas. It displays the formula from the selected cell in a large window. A formula can span as many as 1,000 characters. As with 1-2-3, you can manually or automatically recalculate formulas.

Open Access II's analyzer function helps apply mathematical processes to data. The function uses designated fields from the spreadsheet's data area to generate a table of data. It manipulates the data entered in the data (query) area of the spreadsheet. The data cross analyst window requests the name of the field that will have the calculations performed upon it, the operation to be performed, and the data and output area. Operations include computing the sum, the average, and the standard deviation.

Other *Open Access II* functions include math, trigonometric, statistical, query, business (financial), date, table, and time functions. The spreadsheet can also evaluate conditional expressions using relational and logical operators.

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Performance Tests: Integrated Programs for LANs

Although Open Access II usually produced the fastest times when working with the 500-record database, Smart performed the best overall, especially when tested with the larger databases.

Open Access II's excellent search and direct text-substitution times can be attributed to its internal algorithms. However, its extremely poor times for calculated substitutions point out a possible usage limitation. Another limitation is reflected in its inability to generate reports with the 50,000-record database.

Smart displayed the least performance degradation when tested against progressively larger databases. Its report-generation times for the 5,000-record and 50,000-record database sizes were significantly faster than those of the other tested products.

While Enable performed well with the 500-record database, its overall performance was lackluster. Also, its inability to import a comma-delimited file makes it less flexible than Smart.

Performance Times

(Times given in minutes)

	Smart	Enable	Open Access II
Import Index			
500 records	1.33	N/A ¹	0.54
5,000 records	17.17	N/A ¹	25.17
50,000 records	78.83	N/A ¹	80.17
Sort			
500 records	0.40	0.22	0.04
5,000 records	1.75	4.73	0.08
50,000 records	10.52	45.50	0.32
Simple Report			
500 records	0.10	0.67	0.15
5,000 records	1.22	5.58	3.45
50,000 records	8.30	20.33	20.17
Search			
500 records	0.23	0.12	0.03
5,000 records	1.22	2.02	0.09
50,000 records	13.27	15.98	2.93
Substitution			
500 records	0.28	0.25	0.14
5,000 records	2.30	1.72	1.28
50,000 records	16.10	15.78	20.67
Calculated Substitution			
500 records	0.40	0.32	2.57
5,000 records	4.13	5.43	29.00
50,000 records	24.83	64.67	21.67
One-Table Report			
500 records	0.48	0.70	0.45
5,000 records	4.18	8.90	5.58
50,000 records	21.17	41.00	N/A ¹
Two-Table Report			
500 records	1.22	1.09	0.85
5,000 records	6.43	10.58	13.85
50,000 records	47.33	57.17	N/A ¹
Four-Table Report			
500 records	1.22	1.59	1.31
5,000 records	6.62	6.20	27.50
50,000 records	48.00	78.83	N/A ¹

N/A¹—Not applicable: does not support comma-delimited files.

N/A²—Not applicable: unable to generate reports with the 50,000-record database.

To measure these programs' database management performance, PC Labs ran the programs through common DBMS operations and timed them. Tasks included sorting, searching, substitution, and a variety of reporting functions.

Database management programs that run quickly with small files may choke on larger ones, so sample databases of 500, 5,000, and 50,000 records were used with each product. The model database contains the records of a fictional auto-parts distributor, and each database consists of four smaller "tables," or files, named Product, Supplier, Inventory, and Supplier Type.

The Import/Index test takes the comma-delimited files created by the PC Labs test database-generation program and converts them to indexed database files, indexing on the first field in each database. Some database programs automatically index the file; others require a two-step process of first converting, then indexing the data.

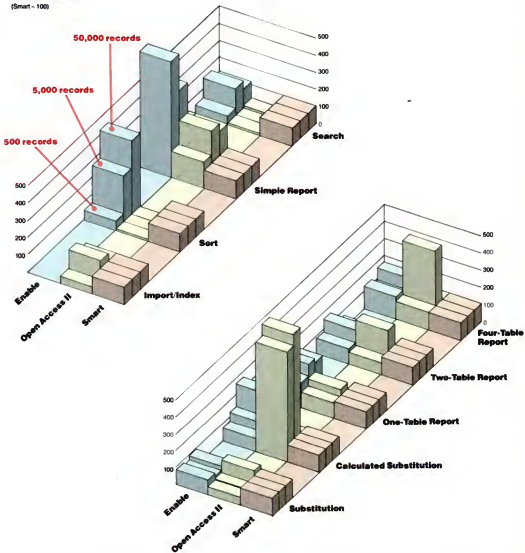
The Sort test shows how long it takes the software to sort the Product file on one field—the year 1988. The Simple Report test requires the database software to generate a sorted report of all records that match 1988. The report is sent to a RAMdisk to avoid printer-related time discrepancies.

The Search test performs a search on two fields (make = dover, model = hatchback). The Substitution test changes all occurrences of "red" in the color field of the Product file to "candy apple." The Calculated Substitution test multiplies the value of a field in all records by 11.

The remaining tests measure the speed with which a product can create reports from a database extract in the form of a 2-year sample (1988–1989) that represents 20 percent of the database.

The One-Table report is a report of six fields from one file, while the Two-Table report uses eight fields from two tables (Product, Inventory), plus a ninth field obtained by subtracting two columns from a table in the database. Both are sorted reports that include a descriptive header, page-number footer, breakpoints, subtotals, and totals. The third report (Four-Table) uses a total of eight fields from all four files, plus two calculated columns, sorted on three levels. All of the reports are sent to a RAMdisk, with the exception of the 50,000-record database—its reports are written to a local workstation hard disk.

Relative Times
(Smart = 100)



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The *Enable* spreadsheet handles math functions much as 1-2-3 and similar programs do. Many standard math, statistical, and business functions, ranging from @SUM and @Variance to @PMT (principal, interest, term), are available.

GRAPHICS *Smart's* graphics capabilities let you define and display graphs that reference the worksheet data and output the graphs to the screen, a plotter, a graphics printer, or a graph definition file to create slide shows. Graphs include bar-line graphs, pie charts, high-low graphs, layer graphs, histograms, and X-Y graphs. Each graph type includes a rich selection of enhancements.

The graphics in *Open Access II* compare favorably with those of many stand-alone business graphics programs. *Open Access II* can generate pie, bar/line, X-Y, stack bar, and 3-D graphs. In addition, it captures displayed graphs in special files called slides, which can be collected in a "carousel." You can use the carousel to edit an existing slide show, display a slide show, and output slides to an output device such as a printer or a plotter.

Enable's graphics applications program lets you create charts and graphs directly from information in the spreadsheet or database. You can send the graphs to the screen, the disk, and a printer or plotter. *Enable* offers two- or three-dimensional bar and stacked bar graphs, line graphs, and pie charts with up to eight data groups specified. You can enhance the graphs with a variety of design options, including a choice of font settings for the titles and headings and changes in shadings and colors in the graph. *Enable* lets you view the spreadsheet data and the graph on-screen simultaneously. It reflects changes made to the data section instantly in the graph section.

With *Enable* you can either print the graph horizontally on a full page or vertically on half a page. You can also select the print density. Printing a high-density graph will show fine details of the graph more clearly but it definitely takes longer. For higher-quality graphics, *Enable* will support graphics plotters with multiple-color capabilities. From the plot menu, you can change the device settings for the pen width, speed specifications, and the

serial port connection to the plotter.

Overall, all three systems have powerful spreadsheet modules capable of replacing whatever spreadsheet you're using. The *Smart* spreadsheet is practical and easy to use, and the *Open Access II* spreadsheet has unique multiuser features. The *Enable* spreadsheet bears many similarities to 1-2-3, but the file format it uses can, in some circumstances, seriously limit the size of your worksheets.

The Communications Programs

Communications programs have traditionally been a mandatory but poorly integrated part of integrated multifunction systems. That isn't the case with these programs. The communications components are clearly a cut above those of most earlier integrated packages.

Even though they are part of networked systems, these communications programs are not designed for use through a communications server on the network. You must use them with a modem attached to an individual PC workstation. They can reside on a disk drive in your PC or on a networked drive, but they are intended for local use.

Essentially, communications programs such as these have two functions. The first is to act as a terminal emulation program, allowing you to dial another computer and act as a terminal. The second is to control file transfers among PCs.

PROGRAMMABLE SMART *Smart's* communications program is a fully programmable package with some remote commands and other advanced features. Called from the *Smart* main menu, the powerful, flexible communications module has a status screen with a ring menu on the bottom and various communications and program settings displayed in three boxes on the screen.

The standard communications settings include data and word length, parity, and other alternatives, plus a couple of DEC terminal (VT-100 family) emulations. You can select from eight common modems, including several Hayes products as well as those from Prentice and U.S. Robotics.

Program functions include capturing data to disk or to a buffer, viewing the buffer, and printing data in the buffer or as it comes in. This package has an excellent transmit-and-receive character-filtering system that can be edited. It can help limit bad characters from being presented on the screen and transmitted control codes from activating printers and other devices.

Programmable communications systems are the state of the art, and you can program the *Smart* system in three basic ways to execute tasks automatically. On a simple level, you can program keys as macros to issue, for example, sign-on codes and log-on sequences. For more complex tasks, the Remember command records everything you do while the system is in the remember mode, including the command formats you use. It will automatically repeat the remembered command sequence at your request. At its most powerful level, you can program the communications by using *Smart's* project processing language. The language adds useful commands such as If, While, Beep, Message (displayed on the screen), and Wait, and you can compile it for faster performance.

Smart's communications program can transmit ASCII files by using a simple transmit command on one end and a capture command on the other end. It can exchange program files, or ASCII files that require high accuracy, by using the Xmodem protocol.

If two PCs are running *Smart*, the operator of the originating machine can execute certain commands on the answering computer, including commands to send and receive files and display a directory of the answering machine's disk drives. These functions can be password protected with four levels of access (from connect only to receive/transmit).

Although *Smart* doesn't offer many terminal emulation choices, the VT-100 emulations it does provide are the most commonly used ones. The *Smart* program is complete enough to be the only communications program most PC users will need.

UNUSUAL FRILLS Along with the traditional communications functions such as terminal emulation and file transfer, the *Open Access II* communications package



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CIRCLE 182 ON READER SERVICE CARD

The difference is compatibility.

Introducing the first software system that solves all three compatibility problems: Between applications. Between PCs. And even between brands of software.

We call it Smart 3.1
You'll call it a lifesaver.

Between Applications

Smart includes the full range of productivity applications your office needs: Word processing, data base management, spreadsheet analysis, business graphics, and communications.

All perfectly integrated for easy transfer of data from one application to the next.



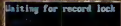
And only Smart lets you create custom programs that actually jump between applications. So, for instance, a single keystroke can transform a worksheet into a 3-D pie chart, paste the chart into a document, and send the document via modem to the home office.



Smart's "RECALL" command lets you jump between recent programs.



Smart's "SEND" command makes it easy to move data between programs.



Smart automatically releases your data in Multiuser mode.

Between Workstations

Every Smart application includes a fully automatic File or Record-Locking scheme for shared data. So right out of the box, Smart can be used either on a single user PC or on a LAN workstation.

Between DOS and UNIX

There are even versions of Smart for multiuser UNIX® and XENIX® systems; all 100% file compatible with the DOS version of Smart.

Which, according to Information Week, makes Smart "the first to provide DOS-UNIX-LAN connectivity without sacrificing power and features."

Between Software Brands

Old software can be replaced, but old data can't. So you'll be pleased to learn that Smart is fully compatible with files already created with programs like Lotus 1-2-3 and dBase III Plus.

Smart also reads and writes ASCII, SYLK, DIF, and DCA.

Oh by the way, there's something else Smart is perfectly compatible with: You. Fact is, nearly every top computing magazine has praised Smart for its ease of use, on-line help, extensive tutorials, and clearly written manuals.

But why not see for yourself?

Just return the attached card, or call toll-free (800) 331-1763 (in Kansas, Alaska or Canada call (913) 492-3800) and we'll rush you a free Smart demo disk and information kit.



SmartWare
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■ INTEGRATED PROGRAMS FOR LANs

handles extensive logging, editing, encryption, and remote file storage and retrieval.

Selecting the Communications option on the *Open Access* main menu brings up a menu of options, including terminal mode. To operate the program, you select options from a series of menus that appear in windows. The terminal mode provides the basics: all the typical communications parameters and a menu of modem setup strings. The program can automatically dial numbers from a prepared list, and it can define keyboard macros for repetitive communications tasks.

The system has only bare-bones VT-100 emulation, but it does contain the *Kermit* file transfer protocol as well as that for Xmodem. It also has something the manual describes as a control sequence language, which resembles assembler more than it does a higher-order programming language.

The Autoservice function makes up in part for the limited programming capabilities of the communications module. The Autoservice command initiates an already constructed process that allows you to enter the information needed to let your computer communicate with another machine unattended. You can set a time and specify many other options and conditions, including several command sequences to be transmitted to the other end.

Selecting Window from the menu lets you set up two horizontal or vertical windows that can display the terminal operation and the operation of the built-in editor. You can use the editor, for example, to preview text files before transmission and to prepare responses to electronic mail. Files are encrypted for storage on disk, and you can send encrypted files only by using the Xmodem or *Kermit* file transfer protocols.

The function of the "bulletin board" in *Open Access II* is only to allow remote users to send, read, and delete files from the system. The remote users do not have to be running the communications program. The bulletin board system does not contain a mail program, but it does have some personalized features keyed to a caller's password and identity. It can prohibit callers from viewing certain volumes and restrict their ability to delete, upload, and down-

load files. The program can also respond to a user's specific screen size by pausing scrolling operations after a specified number of lines.

Logging is an important feature of the remote file transfer service. You can choose to have all data or just BBS commands recorded in a disk file for later checking.

The functional *Open Access II* communications program's strongest feature is the ability to allow remote users to access and manipulate files under security controls. You probably wouldn't throw away *Crosstalk* and substitute *Open Access II*—its frills notwithstanding—but if you buy *Open Access II* first, you might not need another communications package.

EASY AND POWERFUL Since *Enable*'s communications package tries to do a lot, it's no surprise that you first have to set up the program parameters. *Enable* gives you a way to start communicating immediately, but you'll want to customize it before you do any serious work.

Each *Enable* telecommunications setup (you can have up to 256) contains a complete profile of a service or a computer you want to call and use. The profile includes the phone number, transmission rate, and other communications parameters. The thorough but pedantic prompted entry system helps you build new profiles. Fortunately, you can revise the profiles without going through the entire prompted system.

Once the profiles are set up, *Enable* is easy to use. Its good selection of features includes emulation of several DEC and AT&T terminals, the *Kermit*, Xmodem, and *Enable* file transfer protocols, several capture options, and fast entry into the *Enable* word processing module. During a communications session, a ring menu offers a series of alternatives, including capture to buffer, capture to disk, and send to printer. The integration is so smooth that you can start editing text in the capture buffer with the word processing module while the telecommunications module is capturing it and sending it to the buffer.

Enable's penchant for doing things through forms is evident in the unattended communications function, which you use to dial out to services or other computers automatically. Another prompted menu

PC EDITOR'S CHOICE

• Smart

Integrated systems have come a long way, and all of these programs are now strong enough to go up against standalone applications packages. Of the three, Smart has the widest array of powerful features and the smallest number of faults. Strong points include intelligent data sharing and good file security, intuitive ease of use, a powerful programming language, and consistently good performance. Its weak point is the database, which needs more processing power to handle sophisticated relational tasks. Yet in most organizations, Smart can fill the bill for a total, integrated software system.

helps you create a script file to control the unattended operation.

The system's powerful script file language reads a lot like BASIC. It has *DELAY*, *WAIT4*, *PASS*, and other specialized communications statements, along with more typical *GOTO*, *GOSUB*, *IF*, and other logical operators.

Enable has two kinds of mapping tables: a transmit/receive mapping table and a keyboard mapping table. The transmit/receive mapping table is similar to the filtering that the *Open Access II*, *Smart*, and many other spreadsheet programs perform. It translates single characters transmitted or received into other characters or blocks them. The keyboard mapping table helps create macros.

If you take the time to set up the *Enable* communications program properly, you're bound to like it. It combines a structured approach with a powerful script language to give the novice user easy operation and the programmer powerful alternatives.

Frank J. Derfler, Jr., is a contributing editor of PC Magazine. Roberto Rivera is a project leader in the PC Connectivity Labs.

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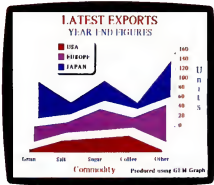
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CIRCLE 239 ON READER SERVICE CARD

Short on brand-name recognition and long on advanced features, Samna Word IV combines power and ease of use in one corporate-level word processing package.

When I tell friends about the merits of the new *Samna Word IV* word processing program, I often get the same response. "If *Samna* is such a great program," they say, "why haven't I heard of it?"

This is a reasonable question. Reputation is, after all, a major part of the perceived value of computer software, and people assume that if a manufacturer develops a good product, he will advertise it. Indeed, advertising can sometimes take precedence over production. It was in the computer marketplace, after all, that the term *vaporware* was invented.

Samna Corp.'s advertising has been limited, and distant enough from current merchandising wisdom that it has not relied upon the usual capitalized letter in the middle of the program's name. Yet despite such handicaps, Samna has managed to attract a solid customer base. The company's approach has been to demonstrate its software directly to data-management specialists at corporations, government agencies, and other volume purchasers.

This is how *Samna* became a standard at Anheuser-Busch, AT&T, GM, Bankers Trust, Whirlpool, the U.S. Navy, HUD, and the U.S. Secret Service, among others.

THE BIG EASY: SAMNA WORD IV

SAMNA'S FEATURES What many people like about *Samna* is its combination of powerful features and ease of use. The *Samna Word IV* program contains virtually every routine you'd want in a top-of-the-line word processor (a list of the most important ones is given in the instructions chart accompanying this article, "PC Magazine's *Samna* Macro Files"). These features make it possible to perform many sophisticated maneuvers easily.

At the same time, *Samna* is easy to learn. It comes with a clearly written manual, an interactive training disk, free support for new users, key-definition labels, and—if you don't like the labels—key-board templates. It has the most extensive set of on-line help messages I've seen in any IBM PC program. The help information is specific to the operation you're engaged in; thus, if you press the F3 key

SAMNA MACROS

Macros are great for automating repetitive tasks and speeding up any kind of word processing work. Here are a few tips to get you started.

Macro routines are useful for many timesaving routines. They let you record a series of alphanumeric or command keystrokes—or a combination of both—and play them back whenever you wish. (*Macros* is the most common name for this feature, which is called *user-defined keys* in *Samna*.)

For an example of how macros can be used, imagine you're writing a series of letters. You'll notice that certain operations will be repeated, such as typing the signature ("Sincerely yours," and so on), saving the file, printing it, opening a file for a new letter, and typing a heading for the file.

As long as this series of tasks never varies, you can use a macro. To begin, you'd start recording keystrokes before typing "Sincerely yours," and end just after entering the date of another letter. Then, when you were about to finish the second letter, you'd play back the macro and the program would enter the keystrokes you previously recorded. The computer's response to the playback is the same as when you enter commands from the keyboard. Thus, your macro would complete a letter, print it, and start the next one; these tasks would be performed quickly and automatically.

ADVANTAGES OF MACROS It may seem that playing back 30 or 40 keystrokes won't save much time. But if you had many letters to write, the minutes saved could add up considerably. It's also true that many of the advantages of working with macros become apparent only after you've used them. For example, a macro can enter keystrokes much more quickly than even a proficient typist. In addition, the sequence of keystrokes is always entered in the same way—which means accurately, unless

they weren't properly recorded. If you tend to make mistakes while executing long commands, this feature may be of help.

Creating *Samna* macro routines involves three steps:

- Entering the command to start recording keystrokes.
- Entering the keystrokes you wish to record.
- Entering the command to stop recording keystrokes.

To record keystrokes, press Select, a number key from 0 to 9, and then Return. (Be sure to use the numbers at the top of the typewriter keyboard and not those on the cursor pad.) Next, enter the keystrokes as you would normally. The effects of your commands will be visible; thus, if you give the command to delete a word, it will be deleted. This helps you see which operations you need to perform as you create a macro.

To stop the recording, use the same command that you gave to begin—Select followed by the number you used and Return. To make things even simpler, the closing command is displayed in a screen prompt so you don't need to memorize it. Playing back a macro involves pressing the same number key you used for creating it while holding down Alt (with the new *Samna* keyboard) or Ctrl (with the old keyboard).

GETTING STARTED If you've never worked with macros, start out simply by creating some short ones and playing them back. Don't work with important files, and avoid destructive macros—those that delete or alter data. All you have to do is follow the directions given here and the screen and Help prompts. If you need additional information on running macros, you can look in



FACT FILE



**Samna Word IV,
Version 1.0**
Samna Corp.
2700 NE Expwy.,
#C-700
Atlanta, GA 30345
(800) 831-9679
List Price: \$595

Requires: 512K RAM, two disk drives,
DOS 2.0 or later.

In Short: A powerful, corporate-level word-processing program that's easy to learn and work with. It adds more than 50 new features to *Samna Word III*, including a sort routine, multiple columns, and editable macros. It comes with a clearly written manual, an interactive training disk, free support, and key-definition labels. Not copy protected.

CIRCLE 65 ON READER SERVICE CARD

Samna Plus IV, Version 1.0

Samna Corp.
2700 NE Expwy., #C-700
Atlanta, GA 30345
(800) 831-9679
List Price: \$695

Requires: 512K RAM, two disk drives,
DOS 2.0 or later.

In Short: Adds a spreadsheet and a text-retrieval routine to the *Samna Word IV* program. *Samna Plus* spreadsheet files are easily converted into standard *Samna* text files, and the program supports floating cells and macros. Not copy protected.

CIRCLE 66 ON READER SERVICE CARD

the *Samna* manual under "User-Defined Function Keys."

USING SAMNA MACRO FILES Each *Samna* macro file contains ten macro routines that correspond to the numbers 0 through 9. (You can use these files only with *Samna IV* and recent releases of *Samna III*.) To work with an existing macro file, copy it onto your *Samna* Program Disk 2, your data disk, or your hard disk drive. Then give the command for setting a macro file (if you're unsure about this command, press Select-u and then Help). If the disk with the macro file isn't in your default drive, remember to include a drive identifier (such as A:) when you're asked for a filename. You can also change the names of macro files.

You won't be able to read *Samna* macro files—they're written in machine language. (If you give the DISPLAY command for a macro file, you'll get an error message.) However, with *Samna IV* you can translate the macro file into a readable text; this is called editing a macro file.

The *PC Magazine* macro files come with two text files, Macedit and Macinfo. The first one gives a printout of the keystrokes for each macro, written in a special *Samna* notation for editing macro files. The second file, Macinfo, has information describing how to create and use these macros.

EDITING A SAMNA MACRO FILE If you own *Samna Word IV*, you'll be able to revise macros by using the macro file-editing utility. One reason to edit macro files is to revise them. Ordinarily, if you make a mistake while recording a macro, you have to start again from the beginning. In *Samna IV*, however, you can complete the macro and later edit it to re-

move the error. Editing is also a good way of creating the *PC Magazine* macro files if you don't have a modem. If you own a version of *Samna III* that lacks the editing feature, the printouts and the macro instructions in the *PC Magazine* Macedit and Macinfo files will give you the information you need to create these macros in the conventional way.

Editing a macro file involves using a

Keyboard Macro File

■ If you own *Samna Word IV*, you'll be able to revise files by using the macro file-editing utility.

Samna command language that looks intimidating but isn't really very hard to understand. In this language, command words appear as uppercase words enclosed in angle brackets; thus, <RETURN> is the equivalent of pressing the Return key. Alphanumeric characters—such as blocks of text, filenames, and letters used in commands—appear outside angle brackets. No spaces are used to separate command words; a space represents the equivalent of pressing the Spacebar.

Thus, <SELECT>k2<RETURN> is the command for changing to keyboard Number 2, the French keyboard. If you look at the printout of the *PC Magazine* macro file called French, you'll see that this is the command entered for Macro 8. A complete list of command words and meanings is included in the *Samna IV* manual.

To try the editing feature, create a

new macro file by giving the command to set a macro file and then entering a filename that doesn't appear in your directory. It's a good idea to add an extension to the filename that indicates a file contains macros.

Next, go to a completely empty scratch pad—delete even paragraph markers—and give the command to edit a macro file, <SELECT>ue<RETURN>. Now type exactly what appears in one of the macro printouts for the *PC Magazine* macro files into the empty macro file.

It helps to give the command to display marks when you edit a macro file; this is so you can see the note lines (these are used to distinguish the macro numbers from the commands). If you accidentally delete a note line, you'll need to restore it with the <MARK>n<RETURN> command.

When you've typed everything correctly, enter the command to translate the edited file back into machine language, <SELECT>ut<RETURN>. At this point the revised macro file will be recorded and will replace the original version of that file. If you make a mistake such as misspelling a command word, the mistake will be underlined and you'll be given an opportunity to enter a correction and to give the macro translation command again.

Don't be too concerned if at first you find these instructions complicated—to understand them, it's best to try them on your computer. Start out by looking through the descriptions of the *PC Magazine* macros to see which of the easier ones you might want to begin with. Later, when you've mastered the basics, you'll find that working with advanced macros isn't really that hard.

—Rubin Rabinovitz



PC Magazine's Samna Macro Files

These are instructions for working with the Samna macro files available on the PC Magazine Interactive Reader Service. Follow the log-on procedures detailed in the sidebar "Dialing for Macros" and begin downloading the files you want to receive. Those with .S4M extensions are for use with *Samna Word IV*; those with .S3M extensions are for use with *Samna III*; files with .ASC extensions are ASCII files. Where operations are different for the *Samna Word III* and *IV* files, this has been noted. Take the time to look at the README file—it will give you important information and tips on viewing and using the Samna files. The .S4M files accompanying these instructions may be copied exactly into a Samna macro file while using the macro editing routine (available only in *Samna Word IV*) and translating them back into machine language. They will produce workable versions of the PC-IRS Samna macro files.

FRENCH A set of macros that facilitates working with French text while using the Samna English keyboard. It inserts some common French letters and permits you to switch easily to and from the French keyboard for other letters you may need. These macros are the same in the *Samna Word IV* (.S4M) and *III* (.S3M) versions.

0. Signals that this macro file was set by requesting the display of a subdirectory called French. If you have such a subdirectory for French-language files, press Return to display the directory listing. Otherwise, press Cancel.

1. Inserts a lowercase *a* with grave accent.
2. Inserts a lowercase *c* with cedilla.
3. Inserts a lowercase *e* with acute accent.
4. Inserts a lowercase *e* with grave accent.
5. Inserts a lowercase *e* with circumflex.
6. Inserts a lowercase *o* with circumflex.
7. Inserts a lowercase *u* with grave accent.
8. Sets the French keyboard.
9. Sets the English keyboard.

GERMAN This set facilitates working with German text when using the Samna English keyboard. It inserts some commonly used German letters and lets you switch easily to and from the German keyboard for other letters. These macros work the same way in the *Samna Word IV* (.S4M) and *III* (.S3M) versions.

0. Signals that the macro file was set by requesting the display of a subdirectory called German. If you have such a subdirectory for German-language files, press Return to display its directory listing. Otherwise, press Cancel.

1. Inserts a lowercase *a* with umlaut.
2. Inserts an uppercase *A* with umlaut.
3. Inserts a lowercase *o* with umlaut.
4. Inserts an uppercase *O* with umlaut.
5. Inserts a lowercase *u* with umlaut.
6. Inserts an uppercase *U* with umlaut.
7. Inserts a double-*z* symbol.
8. Sets the German keyboard.
9. Sets the English keyboard.

GERMAN.S4M

```
0
<DISPLAY>German\
1
<SELECT>k7<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
2
<SELECT>k7<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
3
<SELECT>k7<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
4
<SELECT>k7<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
5
<SELECT>k7<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
6
<SELECT>k7<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
7
<SELECT>k7<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
8
<SELECT>k7<RETURN>
9
<SELECT>k1<RETURN>
```

SPANISH This set facilitates working with Spanish text when using the Samna English keyboard. It inserts some commonly used Spanish letters and lets you switch easily to and from the Spanish keyboard for other letters. These macros work the same way in the *Samna Word IV* (.S4M) and *III* (.S3M) versions.

0. Signals that the macro file was set by requesting the display of a subdirectory called Spanish. If you have such a subdirectory for Spanish-language files, press Return to display its directory listing. Otherwise, press Cancel.

1. Inserts a lowercase *a* with acute accent.
2. Inserts a lowercase *e* with acute accent.
3. Inserts a lowercase *n* with tilde.
4. Inserts an uppercase *N* with tilde.
5. Inserts a lowercase *o* with acute accent.
6. Inserts an inverted question mark.
7. Inserts an inverted exclamation point.
8. Sets the Spanish keyboard.
9. Sets the English keyboard.

TEXTMODE A collection of simple macros for adding text enhancements such as underlining, boldface, and centering. Many of these macros can be used repeatedly; thus, to underline a series of words, use Macro 1 as many times as needed. These macros work the same way in the *Samna Word IV* (.S4M) and *III* (.S3M) versions.

0. Signals that the macro file was set by requesting the display of a directory. To see the directory, press Return; otherwise, press Cancel.

1. Underlines a word.
2. Removes underlining from a word.
3. Changes one word to boldface.
4. Removes boldface from one word.
5. Changes the letters in a word to uppercase.
6. Changes the letters in a word to lowercase.
7. Inserts inhibit-print mark to start inhibit-print (data after this mark can be read on-screen but will not be printed).
8. Inserts stop-inhibit-print mark, which ends the inhibit-print function.
9. Centers one line of text.

FRENCH.S4M

```
0
<DISPLAY>French\
1
<SELECT>k2<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
2
<SELECT>k2<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
3
<SELECT>k2<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
4
<SELECT>k2<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
5
<SELECT>k2<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
6
<SELECT>k2<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
7
<SELECT>k2<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
8
<SELECT>k2<RETURN>
9
<SELECT>k1<RETURN>
```

SPANISH.S4M

```
0
<DISPLAY>Spanish\
1
<SELECT>k4<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
2
<SELECT>k4<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
3
<SELECT>k4<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
4
<SELECT>k4<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
5
<SELECT>k4<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
6
<SELECT>k4<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
7
<SELECT>k4<RETURN><INSERT>^<INSERT><SELECT>k1<RETURN>
8
<SELECT>k4<RETURN>
9
<SELECT>k1<RETURN>
```


PC Magazine's Samna Macro Files

into your printer.

9. Closes a file and prints it. Use this macro only if the default printing entries are acceptable, since it won't give you a chance to change printing options.

ADVANCED.S4M A series of advanced macros. There is no *Samna Word III* version of this file, which contains macros that take advantage of features found only in *Samna Word IV*. Some of these macros must be used together with another macro or a special file. Be sure to read the directions below, and to work with a text file when first using these macros.

0. Signals that the macro file was set by requesting the display of a directory. To see the directory, press Return; otherwise, press Cancel.

1. A change-word routine: it deletes a word at the cursor position and permits you to enter a new word in its place. Be sure to press Return or Tab after typing in the new word in order to complete the macro playback.

2. Searches for a dollar figure (a character string preceded by a dollar sign) and changes that figure to boldface.

3. Searches repeatedly for dollar figures and changes them to boldface (i.e., repeats Macro 2 by using a loop).

4. Searches for the string speaker? and answers "no" to the query in the search menu about entering a replacement. May be used to set the proper search defaults for working with Macro 5. To work with this macro, you need a file with examples of the string speaker? This routine enables you to type "speaker?" in a document instead of a person's name and to add the name later.

5. Lets you search for a word or phrase and replace it with any substitute (versus a single replacement choice in a standard search-and-replace operation). Before starting this macro, give the command for conventional search, type in the search string, and enter N (no) at the question "REPLACE, YES OR NO?" (This is unnecessary if you've used Macro 4.) Then start the macro. The cursor will stop at the search string to permit you to make changes. When you press Tab or Return, the search will continue. The macro will be terminated when the cursor reaches the end of a file.

6. Copies the contents of footnotes into a new file called FOOTNOTE. To use this macro, you need to set your default menu so document descriptions are not displayed. This macro will create a *Samna* file called FOOTNOTE in your root directory (it will also work if you already have a FOOTNOTE file). Before you start, position your cursor at the beginning of a *Samna* text file that contains foot-

notes. Then start the macro. When the macro ends, display the FOOTNOTE file to see whether the footnotes were copied to it properly. This macro works by creating a file named FOOTNOTE, closing the file, and starting Macro 7. The second macro searches for a footnote mark with the command <GOTO><MARK>f, displays a footnote, copies it, and closes the footnote window. It then displays FOOTNOTE in a window, dumps the buffer, closes the window, and starts over again. The <EXITEOF> command (exit at end of file) terminates the operation when the cursor reaches the end of the file.

7. Don't use this macro—it will be started by Macro 6.

8. This macro works with Macro 9 to demonstrate the function of a counter file. It contains a routine that capitalizes every other word in a text file, and will repeat this operation as many times as you specify. To use this macro, you need to have a copy of the COUNTER file in your root directory. (This file is included in the *Samna Word IV* macro files set; if you don't have these files, you'll find directions for creating the COUNTER file below.) Before starting this macro, display the COUNTER file and enter a place marker with the command <MARK><TAB><RETURN> after the figure that represents the number of times you want the oper-

ation repeated. If the number ends in zero (10, 20, etc.), position the place marker between the left margin and the next lower number (9, 19, etc.). Then go into your text file, position the cursor at the first word to be capitalized, and start the macro. The macro will capitalize a word, skip a word, position the cursor at a third word, and then repeat this operation as many times as you specified by setting the COUNTER file. This macro works by displaying the COUNTER file in a window and moving to the place marker positioned after a number. It then goes to your text file and starts Macro 9. This macro sends the cursor into the window with the COUNTER file, moves forward one word to tick off a number, returns to the text file, capitalizes a word and skips the next word, and then starts Macro 9 again. An <EXITEOF> Command in this macro stops the operation when the cursor reaches the end of the COUNTER file. If you need to, you can enlarge the size of the COUNTER file. Once you've understood how this macro works, you can rewrite it to perform a useful task.

9. Don't use this macro—it will be started by Macro 8.

ADVANCED.S4M

```
0
<DISPLAY>f
1
<DELETE>WORD<RETURN><INSERT><KEYBOARD><INSERT>
2
<GO>f<RETURN><RETURN><CANCEL><RENAME>bWORD<RETURN>
3
<KEYWORD>f<GO>f<RETURN><RETURN><CANCEL><RENAME>bWORD<RETURN>
<KEYWORD>f
4
<GO>speaker?<RETURN>nanf<RETURN><CANCEL>
5
<GO>f<RETURN><CANCEL><KEYWORD><KEYBOARD><KEYWORD>f
6
<RECORD>DISPLAYfootnote<RETURN><RETURN><DISPLAY><RETURN>
<KEYWORD>f
7
<GO>NAMEf<EXITEOF>NAMEf<RETURN>WORD<GO>fNAMEf<RETURN>
<DISPLAY><RETURN><RECORD><DISPLAY>footnote<RETURN><GO>fNAMEf
<INSERT><RETURN><DISPLAY><RETURN><KEYWORD>f
8
<RECORD>DISPLAYcounter<RETURN><GOTO>TAB<GOTO>FILE<KEYWORD>f
9
<GOTO>FILEfWORD<KEYWORD>f<GOTO>FILEfRENAMEbWORD<RETURN>
<RECORD><KEYWORD>f
```

How to Create a COUNTER File

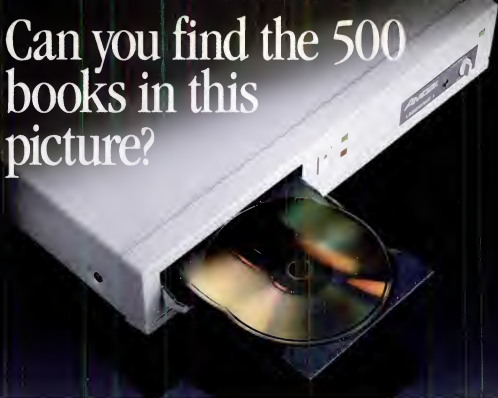
The COUNTER file is a *Samna* file used in conjunction with Macros 8 and 9 (left); it should be named COUNTER and be placed in your root directory. Create a *Samna* file and enter the following table of numbers in it. Leave an empty space between the left margin and the numbers that end in 9, and each line should end with a space and a paragraph marker.

```
99 98 97 96 95 94 93 92 91 89 88 87 86 85 84 83 82 81 79
78 77 76 75 74 73 72 71 69 68 67 66 65 64 63 62 61 59 58
57 56 55 54 53 52 51 49 48 47 46 45 44 43 42 41 39 38 37
36 35 34 33 32 31 29 28 27 26 25 24 23 22 21 19 18 17 16
15 14 13 12 11 09 08 07 06 05 04 03 02 01
```

Note that you don't need to enter 90, 80, 70, and so on because the paragraph marker acts as a substitute for those numbers. If you wish, you can enlarge the COUNTER file. Thus, adding a second copy of this table will let you count to 200. Be sure to enter a place marker in the COUNTER file before starting—the macro won't work properly otherwise.

—Robin Rabinovitz

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■ SAMNA WORD IV

■ *Samna* can translate files from other programs (ASCII, DCA Revisable and Final Form, .DIF, Navy .DIF, and the TIFF graphics format).

(which governs printing operations) and ask for help, information about print commands will appear on-screen.

Many of the *Samna*-defined keys are dedicated to cursor control. This makes for precise and rapid cursor movement, and provides such amenities as moving from the middle of one line to the beginning of the next with one keystroke. (A forthcoming release will add a command for moving to the last character in a line). The program's command structure is straightforward, logical, and intuitive; if you forget a command, guessing at it will probably prove correct.

Samna can translate files from many other programs (ASCII, DCA Revisable and Final Form, .DIF, Navy .DIF, *Decision Graphics*, and in a forthcoming release, the TIFF graphics format). It can run on PCs, ATs, and most compatibles (including those utilizing 386 microprocessors); on the PS/2 and other 3½-inch-disk machines; and on many other computers, including the RT-PC and a number of UNIX-based systems. The program's multiuser version is compatible with the IBM PC Local Area Network, 3Com, Novell, and AT&T StarLAN networking environments. Special versions of *Samna* are under license to a number of OEMs, including AT&T, DEC, Hewlett-Packard, IBM, and Sharp.

A new DOS-compatible keyboard permits *Samna* to run concurrently with most memory-resident programs. The program supports some 70 printers and 20 sheet-feeders, and users can add printer escape

sequences to text files. *Samna* comes with an excellent spelling checker that also provides word counts and automatic hyphenation. The program can emulate ten foreign-language or special-symbol keyboards and a Dvorak keyboard.

Samna Corp. provides a number of useful add-on programs at an additional charge. These include a spreadsheet (*Samna Plus*); a text-retrieval package (*Wordbase Manager*, bundled with *Samna Plus*); a graphics program (*Samna Decision Graphics*); French, German, medical, and legal spelling checkers; and a set of boilerplate legal forms.

Samna Word IV is a large program and requires 512K bytes of machine memory (*Samna Word I, II, and III* are scaled-down versions with fewer features). The program is actually a great deal larger than this—many command files are on overlays. Thus, the routines for working with graphics and equations can't be used in the floppy-disk version of the *Samna Word IV* program: there just isn't enough room for

them on the program disks.

It helps to use *Samna* with a hard disk, since some of its routines can be slow on a floppy-drive PC. The program comes into its own on a 286- or 386-processor machine. Here you can enjoy a wide range of convenience features without paying a price in terms of speed.

A number of improvements in the *Samna* program are being planned. These include enhanced capabilities in document publishing, such as improvements in formatting, font handling, graphics generation, and features for producing compound documents (those containing both text and graphics). A version of the program with 1-2-3 .PIC file format capability will soon be released. Also under development is a release that will run under the forthcoming IBM-Microsoft OS/2 operating system.

The new *Samna Law Library* is a specialized version of the word processing program that includes a legal dictionary, citation checking, and document comparison, and it can interface with popular legal

DIALING FOR MACROS

As an alternative to typing in each Amacro, you can download them all with a modem by calling the PC Magazine Interactive Reader Service. On the East Coast dial (212) 696-0360; on the West Coast the number is (415) 598-9100. Set your modem to 2400/1200/300 bits per second, 8 databits, 1 stop bit, and no parity. Busy signals are not uncommon; simply hang up and call again, or set your modem to redial.

Once you get connected you'll be greeted with a short message; then we'll ask you a few questions—name, city, state, and so on. You don't need a password, and you don't need to know your PC Magazine subscription number. We will log you on and display the main menu. From the main menu choose D to download. You will be sent to the download directory. From there you have a choice of 13 menus, containing from 5 to 80 files each. Select Download menu 5. The menu will scroll asking if you want to see more. At the prompt "Choose a

file name or number," enter the number of the file that you want to receive; in this case it is SAMMAC.EXE. The IRS will display "Ready to transmit SAMMAC .EXE, begin receiving."

Now is the time for you to go into your file receive mode. The IRS sends files by the Xmodem protocol, so be sure you know how to implement Xmodem in your communication software.

SAMMAC.EXE is a self-extracting ARC file. In other words, it has been archived to save space and the amount of time you spend on the telephone. To extract all the macro files, simply type SAMMAC and the ARChive will extract the 18 files it contains. There is a README file with descriptions of the other files that can be accessed by read through DOS by typing TYPE README.ASC.—Christopher Barr

Christopher Barr is the manager of the PC Magazine Interactive Reader Service.

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CIRCLE 304 ON READER SERVICE CARD

■ SAMNA WORD IV

timekeeping and billing software. (Because of these features, *Samna* recently became the first word processing program to win the endorsement of the American Bar Association.) Other professional versions of the program are in the planning stages, with enhancements that people in areas such as engineering and finance will find useful.

SAMNA'S ADVANCED ROUTINES

If you've tried *Samna* or another of the corporate-level word-processing programs, you may have been a bit intimidated by their wide arrays of specialized operations. In fact, many people react this way and are reluctant to take advantage of a program's advanced features.

It's worth overcoming this feeling, however. Anyone who spends even a few hours a week word-processing can benefit from these features. If learning about them seems arduous or time-consuming, don't be put off. The basics are not very difficult, and they can contribute greatly to your productivity.

It's not only time you'll gain once you learn these routines, they will also make

■ Learning the basic features of the *Samna* program is not very difficult, and they can contribute greatly to your productivity.

your work much less tedious. And, in addition to that, they may be of help in preventing data loss.

Moreover, if you're working with *Samna*, you'll find that its comprehensive help facilities make even somewhat complex routines easy to learn.

What follows is advice about how you can best take advantage of one of the most useful of these advanced features, macros. The accompanying sidebar, "Samna Macros," will be helpful if you aren't familiar

■ If you're working with *Samna*, you'll find that its comprehensive help facilities make even somewhat complex routines easy to learn.

with macros or with *Samna* command notation.

You'll be able to perform all of the operations described here with *Samna Word IV*, and most of them with recent releases of *Samna Word III*. Some of these routines can be adapted to work with other advanced word processors like *WordPerfect* or *Microsoft Word*.

Running a program like *SmartKey* (by Software Research Technologies) or *Pro-Key* (by RoseSoft) with a word processor that lacks macro capability will also let you perform some of these routines.

USING THE MACRO FILES If you have a modem you'll be able to download a group of *Samna* macro files from *PC Magazine*. If you don't own a modem, you can create these files by using the descriptions and printouts of macro files that accompany this article. One version of them is compatible with *Samna Word IV*; these have the extension ".SAM" (*Samna IV* Macros). The files in the other series are for use with *Samna Word III*; these have ".S3M" extensions. To work with the *PC Magazine* macro files you need *Samna Word IV* or a release of *Samna Word III* that permits you to set macro files. (To determine whether your version of *Samna* sets macro files, enter the command <SELECT><u><HELP>; if you see a prompt about selecting a user-defined keystroke file, you will be able to work with the *PC Magazine Samna* macro files.)

This list will give you an idea of what's included in the *PC Magazine Samna* macro files:

■ French—a set of routines for working

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■ SAMNA WORD IV

on text documents in French.

■ German—routines for working on documents in German.

■ Spanish—routines for working on documents in Spanish.

■ Textmode—routines for underlining and centering.

■ Mistool—a variety of useful routines.

■ Mailhelp—routines for working with correspondence.

■ Advanced—a group of advanced routines.

If you're an experienced *Samna* user, you can try these to see which ones you like. If you're just starting out, working with them will provide a good way to learn about macros.



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AN EASY MACRO The most commonly used macros are often fairly short, and one of my favorite macros is one of these, a routine for underlining one word. (This macro is Textmode-1, or Number 1 in "Textmode," one of the *PC Magazine Samna* macro files.) Because I'm often italicizing items—like the title of this mag-

■ A useful quality of Textmode-1, or Number 1 in "Textmode," one of the *PC Magazine* macro files, is that it can be used repeatedly.

azine in the last sentence—I find this macro valuable, even though it saves only a few keystrokes.

Another useful thing about this macro is that it can be used repeatedly. To see how this works, set the Textmode macro file, go into a text file, and try holding down Alt and pressing the 1 key a number of times. As you'll discover, each time you do this another word will be underlined. (Be sure, by the way, to use the numbers on the typewriter keyboard, and to press Ctrl instead of Alt if you're working with the old *Samna* keyboard.)

You may have noticed that each time you set a new macro file, the routine programmed under the number 0 is automatically played back. For this reason it's not wise to record complex or destructive routines under Number 0. I usually enter the command for displaying a directory under 0, but leave out the return at the end (such a macro is recorded under Mistool-0). Leaving out the return command makes it

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■ SAMNA WORD IV

easy either to cancel the command or to display a directory by pressing Return when the macro ends.

An amended version of this macro is helpful for working with different directories on a hard disk. Let's say you have a subdirectory for your correspondence that's called Mail. You could create a macro file with different routines for working with correspondence (like Mailhelp, which is one of the *PC Magazine Samna* macro files). Then you could record the command for displaying the Mail Subdirectory as Macro 0:

```
<DISPLAY>mail\
```

You should note that the backslash goes after the subdirectory name, and that you don't have to add the letter *d* to this command; *Samna* will display a directory listing even when you ask for only mail. (*Samna* is also smart enough to assume that you meant to use a backslash if you en-

ter a slash in a path command.)

Once this command is properly recorded, you'll see "mail\" in the status line whenever you set the macro file that serves

■ Once you note which macro file is set, you can enter a filename after the backslash to display a file.

the Mail subdirectory. Since the return command is omitted in this routine, it serves as an indicator that the Mailhelp macro file was successfully set. Similarly, if you later forget which macro file you've

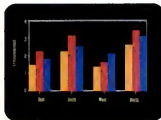
set, starting Macro 0 will provide a reminder.

Once you note which macro file is set, you can press return to display a directory listing; or you can enter a filename after the backslash to display a file. This routine can also be used to create or retrieve a file in the Mail subdirectory; it saves you the key-strokes it takes to type the subdirectory name. This trick becomes even more useful when you're working with subdirectories a number of levels below the root directory. The *PC Magazine Samna* macro file called Mailhelp has this last routine programmed under Number 0, so you can easily try the operations just described.

CORRESPONDING Mailhelp contains other routines that are useful for working with correspondence. One of my favorites is a wastebasket routine for preserving deleted material (it's listed under Number 1). As you may know, deleted text can be re-

To get Lotus 1-2-3 to do all this more quickly and easily, we didn't make it more powerful.

To graph sales by district from January to March just request "graph Jan to Mar."



District	Jan	Feb	Mar	Total
East	4000	5000	6000	15000
West	3000	4000	5000	12000
South	2000	3000	4000	9000
North	1000	2000	3000	6000

These macros are made of Lotus HAL requests. Easy to write. Easy to understand. Easy to test.

Say you want to extract specific information from a database. In this case, simply request "who has sales > \$8000."

District	Jan	Feb	Mar	Total
East	4000	5000	6000	15000
West	3000	4000	5000	12000
South	2000	3000	4000	9000
North	1000	2000	3000	6000

District	Jan	Feb	Mar	Total
East	4000	5000	6000	15000
West	3000	4000	5000	12000
South	2000	3000	4000	9000
North	1000	2000	3000	6000

You can sum up sales figures with Lotus HAL, by requesting "total all rows." 1-2-3 and Lotus HAL will create the formulas.

tried with the *Samna* Undelete command, but this applies only to the block of text you last removed. The wastebasket macro makes it easy to save deleted material in a file.

To try this routine, go into a *Samna* file and delete some text; then start Mailhelp-1. The first time you use it, this macro will create a file called MAILDUMP in your root directory, display it in a window, and copy whatever you last deleted into it. When you next use Mailhelp-1, it will copy just what you last deleted into MAILDUMP. This macro may be used each time you delete something you suspect you may later need. The next macro in this group, Mailhelp-2, displays the MAILDUMP file in a window; it's used when you want to retrieve some of the material that you deleted earlier.

Mailhelp-3 inserts a special mark that enters the correct date when your document is printed. Other routines in the Mail-

help group are useful for saving time with the opening and closing portions of a letter. You might want to try some of these routines on your own, especially if you of-

■ The French, German and Spanish files let you use the English keyboard with foreign-language documents.

ten work with correspondence.

The French, German, and Spanish macro files permit you to use the English keyboard when working with foreign-language or multilingual documents. Each of

these files contains routines for inserting commonly used foreign letters and for easily switching back and forth between English and foreign-language keyboards. These files have Macro O programmed to display subdirectories called French\, German\, or Spanish\. To take advantage of this feature, you'll need to create subdirectories with these names.

If you have a hard disk, a related option is open to you. Let's say you often use subdirectories called Mail, French, German, and Spanish. Each of these might contain a macro file useful for working with the documents in that subdirectory (like Mailhelp and the foreign-language macro files just described). Once your hard disk is organized in this way, you can use your default macro file to set the macro files that correspond to each subdirectory. You'll find that this facilitates moving from one subdirectory to another.

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Hard Drive	—	—	1.204 MByte	—	1.104 MByte	—	1.104 MByte	1.104 MByte	—
Internal Memory	512K	384K	640K	640K	640K	640K	512K	640K	640K
Battery Duration Time	4 to 8 hours	8 hours	8 hours	4 to 8 hours	CPU for Avail	8 hours	4 hours	2 hours	3 hours
Clock Time (Mins)	4.77	4.77 or 0.58	4.77	4.77 or 0.58	4 or 8	4.77 or 7.5	8	4.77 or 8	4.77 or 8
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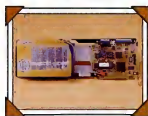


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■ SAMNA WORD IV

macro routines that permit you to leave the computer during a time-consuming operation. One example is changing the format to a long file. To do this, enter the format command, shade the file, and press Return; with a floppy-disk PC, the process can take a few minutes. A macro lets you to do some other job while the computer is working. Two of the *PC Magazine Samna* macro files are for this kind of format change: Miscoot-7 (which changes a text file to 10 pitch and sets the margins at 10 and 75) and Miscoot-8 (which changes a file to 12 pitch and sets the margins at 2 and 80). These macros may be edited if the format options aren't the ones you need.

ADVANCED MACROS Once you've learned how to create simple macros, you may want to try some that execute more complex routines, like those that utilize the special macro command called <KEYBOARD>. This command suspends a

macro so you can type in data from the keyboard; when you finish typing, pressing Tab or Return restarts the macro. This

■ **Macro 1 is a simple change-word routine: it deletes a word at the cursor position, goes into insert mode, then lets you type in a new word.**

command can't be recorded; to enter it you need to edit a macro file, type the word <KEYBOARD> in the proper command line, and translate the macro file back into

machine language. (This option is available only in *Samna Word IV*; an accompanying article explains in greater detail how to edit macro files.)

To see how the <KEYBOARD> command works, try using Macro 1 in the Advanced.S4M file (see "PC Magazine's *Samna* Macro Files"). This macro consists of a simple change-word routine: it deletes a word at the cursor position, goes into insert mode, and then stops to let you type in a new word. When you finish typing and press Return, the macro resumes and gives the command to exit from insert mode. In *Samna* command notation, Advanced-1 looks like this:

```
<DELETE><WORD><RETURN>
<INSERT>
<KEYBOARD><INSERT>
```

One thing to remember when using the <KEYBOARD> command is to press Return or Tab to complete the remainder

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■ SAMNA WORD IV

of the macro. If some functions don't work properly after you've used a <KEY-BOARD> command, it may be that you forgot to press Return or Tab to restart the macro.

REPETITIVE OPERATIONS Another powerful type of macro involves recurring operations. For example, let's say you want to highlight the dollar amounts (numbers with dollar signs) in a document by

changing them to boldface. Ordinarily, you'd start a search for a dollar sign, end the search at a dollar figure, add boldface to the figure, and keep repeating the process.

A macro that performs one cycle of this routine is recorded under Number 2 of the Advanced file. To try it, create a *Samna* file that has some dollar amounts or add some to an existing file. As you'll see, if you want to highlight more than one figure you'll need to execute Advanced-2 again.

What's needed, then, is a macro that will find every dollar amount in a file and change it to boldface. One way of doing this might be to guess how often the search string occurs and to repeat the commands that many times. But this is hardly an elegant approach. A better solution is to use

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■ The word *endlessly* signals a new difficulty: how can you get the macro to stop once it's finished the task at hand? The problem is solved by another macro command.

what programmers call a loop. In *Samna* you can create a loop by writing a macro whose last command starts that macro over again. Thus, to create a loop in Macro 3, the last command you'd enter in it would be to restart Macro 3. The good thing about a loop is that you need write a command only once for a routine that can be performed endlessly.

But the word *endlessly* signals a new difficulty: how can you get the macro to stop once it's finished the task at hand? In *Samna* this problem is solved by another special macro command, <EXITEOF>. This command, which stands for "Exit, end of file," terminates a macro routine when the cursor reaches the last line of a file. Like the <KEYBOARD> command, <EXITEOF> can be entered only

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■ SAMNA WORD IV

by typing in the command word when editing a macro file.

These two operations—looping and exiting—are used together in the Advanced-3 macro, which goes through a file and changes all the dollar amounts to boldface. It should be clear how this operation works if you look at printouts of the Advanced-2 and Advanced-3 macros:

```
2
<D0>s$<RETURN><RETURN>
<CANCEL>
<ENHANCE>b<WORD><RETURN>
<EXITEOF><D0>s$<RETURN>
<RETURN><CANCEL>
<ENHANCE>b<WORD><RETURN>
<USERKEY-3>
```

Advanced-2 searches for a dollar amount and changes it to boldface; it does this only once. Advanced-3 contains all of the commands in Advanced-2, but adds <EXITEOF> at the beginning and

<USERKEY-3> at the end; the <USERKEY-3> command is the one for starting Macro 3 over again. This macro begins by

■ **Macro 5 in the Advanced file makes use of the loop commands and shows how to combine a loop with a keyboard command.**

checking whether the cursor is at the end of a file; if not, it performs the boldface operation and then restarts itself.

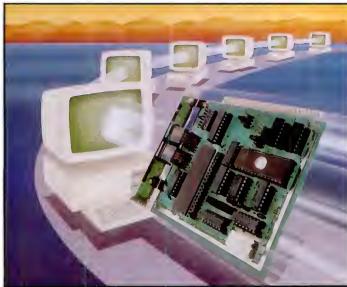
Once you've worked with loops, you'll

find that they can be very versatile. To try writing a macro with a loop, set a new macro file and enter a simple macro (such as for underlining a word) under Number 1. Next, edit the macro file and insert <EXITEOF> at the beginning and <USERKEY-1> at the end. Remember that macros need to be separated by note lines. (To see the format you need to follow, give the command for displaying marks when you have the edited version of a macro file on-screen.) When you're finished typing, give the command to translate the macro file back into machine language. If you've typed any entries incorrectly, they will be underlined so you can revise them.

COMBINING THE COMMANDS Macro 5 in the Advanced file makes use of the commands you just read about and illustrates how to combine a loop with a <KEYBOARD> command. Advanced-

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■ SAMNA WORD IV

5 performs a search-and-replace operation that permits you to decide what each replacement string should be (a conventional search-and-replace routine gives you only one choice for the replacement). This macro works by putting the command for a search-and-replace operation into a loop and then using the <KEYBOARD> command to give you a chance to type in the replacement string.

You might use this macro if you were transcribing the minutes of a conference and were uncertain about the names of some of the speakers. Thus, each time you quoted an unidentified speaker, you would type "Speaker?" instead of a name. Once you had the names of the participants, you could use Advanced-5 to find the search string Speaker? and enter the speakers' names properly.

To use Advanced-5, you'll need to conduct a conventional search operation one time before starting the macro; this lets you

type in the correct search string. When the Search Menu is on the screen, answer "No" to the question about replacing the

■ **To use Advanced-5**
you'll need to conduct a conventional search operation one time before starting; this lets you type in the string.

search string. If you have the *PC Magazine Samna* macro files, you can use Advanced-4 to prepare for Advanced-5; it will enter the search string Speaker? and

fill in the proper menu choices. Next, prepare a text file that contains examples of your search string (Speaker? or the one you will be using).

Once the search menu is properly configured, you can start Advanced-5. The macro will start a search and, when the search string is located, cancel it and enter the <KEYBOARD> command so you can type in a replacement. When you press Return, the macro will start the operation over again from the beginning. This is a printout of Advanced-5:

```
<DO>s<RETURN><RETURN>
<CANCEL>
<EXITEOF><KEYBOARD>
<USERKEY-5>
```

The first half of the routine starts a search and, when the search string is located, cancels it. Then the <EXITEOF> command checks to determine whether the cursor is at the end of a file. If it is, the

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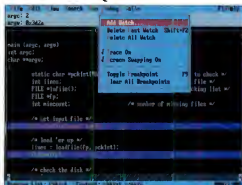
No graphics library.



No on-line help for the C language or library routines.

Life is not fair.

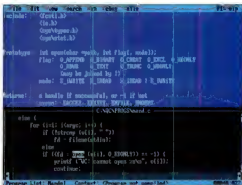
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Context-sensitive help for C language	Yes	—
Context-sensitive help for C functions	Yes	—
Brace, bracket & parenthesis matching	Yes	—
Mouse support	Yes	—
Support for EGA 43-line mode	Yes	—
Documentation		
Complete C language reference	Yes	—
Examples for every library routine	Yes	—
Compiler		
Completely Microsoft CodeView compatible	Yes	—
Automatic enregistering	Yes	Yes
Integrated MAKE		
Automatically generates .MAK file	Yes	—
In-memory MAKE compatible	Yes	—
with stand-alone MAKE	Yes	—
Include file dependencies	Yes	Yes
Libraries		
Graphics library included	Yes	—
CGA & EGA and VGA support	Yes	—
Library source code available	Yes (\$150)	Yes (\$150)
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■ SAMNA WORD IV

macro stops. If it isn't, the <KEY-BOARD> command permits you to type in the replacement. After you press Return, the <USERKEY-5> command starts Macro 5 over again.

COMBINING TWO MACROS In some cases you'll want a macro to do a preliminary task before it goes into a loop. In *Samna* this is accomplished by using two macros in conjunction. The preliminary steps are done in the first macro, which ends with a command to start another macro; the second macro contains the loop.

An example will make this clear. Let's say you wanted to copy the footnotes for a

■ In some cases you'll want a macro to do a preliminary task before it goes into a loop. In *Samna* this is accomplished by using two macros in conjunction.

document into a file. To create such a file, you could follow this series of steps:

1. Create a footnotes-only file in a window.
 2. Save the footnotes-only file.
 3. Go to a footnote in the document file.
 4. Display the footnote.
 5. Copy the footnote.
 6. Close the footnote window.
 7. Display the footnotes-only file in a window.
 8. Copy the footnote into the footnotes-only file.
 9. Close the footnotes-only file.
 10. Go back to step 3 and start again.
- Then repeat steps 3 through 10 as many times as needed.

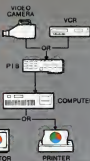
To automate this routine, you could perform steps 1 and 2 in a macro, and then give the command to start a second macro

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■ SAMNA WORD IV

that would perform steps 3 through 10 and then restart itself. Of course, you would probably also want to add an <EXITEOF> command so the routine won't go on endlessly.

Macros 6 and 7 in the Advanced file perform the operations just described: they go through a file and copy the contents of its footnotes to a second file. If you look at the printout for these two macros, you

should understand how the macros work together:

```
6
<SECOND-DISPLAY> footnote
<RETURN><RETURN>
<DISPLAY><RETURN>
<USERKEY-7>

7
<GOTO><MARK>f<EXITEOF>
<MARK>f<RETURN><WORD>
<DO>c<PAGE><RETURN>
<DISPLAY><RETURN>
<SECOND-DISPLAY> footnote
<RETURN><FILE>
<DO><INSERT><RETURN>
<DISPLAY><RETURN>
<USER-KEY-7>
```

Macro 6 contains the preliminary operation; it creates a file called FOOTNOTE in a window, saves it, and then starts the next macro. Macro 7 contains the loop: it goes to a footnote, displays it, copies it, and closes the footnote window. It then places a copy of the footnote at the end of the FOOTNOTE file and restarts itself.

Once you've tried these macros, you may discover that though you can stop a macro at the end of a file, you can't get it to

■ **Macros 6 and 7 in the Advanced file work together to go through a file and copy the contents of its footnotes to a second file.**

perform a task a specific number of times. However, there is a way to do this. The trick is to use two macros and a special COUNTER file—one that's used to check how many times a task is performed. The COUNTER file is an ordinary text file that contains lines of numbers in descending order, such as the following:

```
19 18 17 16 15 14 13 12 11
09 08 07 06 05 04 03 02 01
```

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PC MAGAZINE ■ NOVEMBER 24, 1987

■ SAMNA WORD IV

Before starting this macro routine, you'll need to enter a place marker after the numeral that represents the number of times that you want an operation repeated.

The first macro begins by displaying

the COUNTER file in a window and going to the place marker—that is, skipping directly to the number you've designated. Then it goes into the window with your document and starts the second macro.

This macro contains a loop that moves past a number in the COUNTER file, goes to the document file to perform a task, and then returns to the COUNTER file to tick off another number. When the cursor reaches the end of the COUNTER file, an <EXITEOF> command stops it.

The Advanced-8 and Advanced-9 macros will demonstrate this routine. They're to be used in conjunction with the counter file that's included with the *PC Magazine Samna Word IV* macro files. (If you don't have a copy of this file, you can create one by following the directions at the end of the instructions for working with the Advanced macro file.)

The task these macros perform is to go through a file capitalizing every other word—I've deliberately chosen a simple routine to make it easier to see how the routine works. Once you understand the prin-

■ The Advanced-8 and Advanced-9 macros are used in conjunction with the counter file that's included with the *PC Magazine Samna Word IV* macro files.

ciples involved, you can rewrite the macros to be more useful.

As the printout of the edited file indicates, Advanced-8 displays the COUNTER file in a window, positions the cursor at the number you've chosen with the <GOTO> <TAB> command, moves into the other window, and starts the second macro:

```
<SECOND-DISPLAY>counter
<RETURN>
<GOTO><TAB><GOTO><FILE>
<USERKEY-9>
```

The ADVANCED-9 macro sends the cursor back into the COUNTER file and, by moving forward one word, checks off a number. Next, the program determines



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■ SAMNA WORD IV

whether the cursor is at the end of a file; if not, the macro goes into the document file and performs the task—to capitalize a word and to skip the next one. The final command starts Macro 9 over again:

```
<GOTO><FILE><WORD>
<EXITEOF>
<GOTO><FILE><ENHANCE>u
<WORD><RETURN><WORD>
<USERKEY-9>
```

This routine is written in such a way that the counter file is cleared each time you use it. If you wish, though, you can rewrite the macro so the counter file can remain set at a particular number. To do this, use a character such as x instead of the place marker; and use <GOTO>x instead of the original <GOTO><TAB> command.

Here's an example of how this macro might be incorporated into a more useful routine. Let's say you wanted the first 30 references to a particular person in a long document. You could rewrite the routine so the go to command seeks that person's name and then give the command to copy the sentence with that name to another file. In the same way, you could search in an address list for a given number of people with a particular ZIP code and then print out these listings as they were found.

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OPTIMIZING TURBO PASCAL: A PRIMER

Turbo Pascal can't rival assembler for speed, but with these techniques and tools you can achieve remarkable reductions both in running time and code size.

Turbo Pascal is both small and fast, and so are the programs it produces. But no program compiled under a high-level language like Pascal will be as efficient as the same program coded in assembler. Programming in Turbo Pascal is quicker and easier than in assembler, but you gain that ease at the cost of size and speed.

This fact should worry you, because program efficiency is important. A larger program takes up more space both on disk and in RAM. In a multitasking environment the RAM-cost of a program is crucial. If your program is RAM resident, again you want it to be as small as possible. And when it comes to execution speed, the program that pops is the program that sells.

I'm not suggesting that you give up Turbo Pascal and switch to assembler. Rather, by *optimizing* your programs you can reduce their size and increase their speed. Optimizing lets you keep the advantages of high-level language programming while adding some of the advantages of assembler.

You can optimize with nothing but the Turbo Pascal compiler, some handy routines, and your own wits. I'll assume that you have Turbo Pascal and the PC-DOS DEBUG program as a minimum. Note, however, that many of the techniques I'll describe are not specific to Turbo Pascal: the principles apply to any high-level language (HLL).

TRADE-OFFS While by using an HLL you've already traded size and speed for clarity and convenience, that isn't the last

trade-off you'll make. One of Murphy's Laws states that as code size increases, paradoxically, so does speed. The fastest algorithm may take the most code and vice versa. For example, suppose you need to

get the sine of an angle in $1/10$ degree increments. Turbo Pascal has a built-in `sin` function you can call with a single line of code, but it's slow. If instead you create a constant array containing the sine for every value from 1 to 360 by tenths, you'll be able to look up a sine in almost no time. Fast, yes, but the array will take up 21,600 bytes from the code segment.

You may also gain speed at the expense of flexibility. If you know the input to a given routine will be within a specific range, you can tailor the routine to that range. The tailored routine, however, becomes nonportable—you can't reuse it in another program with a different range.

You may be able to make your program both smaller and faster, but often you must decide which is more important. If you must fit many small programs on one disk, if your program is RAM resident, or if it's pushing the 64K code limit, size is most important. If it's performing long and complex calculations, if it has to respond to outside input in real time (e.g., serial communication), or if it's competing with other fast programs, speed is most important. If the program is part of a project in conjunction with other programmers, or someone else will maintain the code, clarity may be more important than either size or speed. Consider carefully and choose what to concentrate on optimizing.

Begin by determining where your optimizing effort will be best spent. Rather than rush in to rewrite every line of the program, find out what parts get the most use and speed up those parts. Find out which routines take the most code and shrink

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them. You may replace them with commercial preoptimized routines or analyze their behavior and rewrite them more efficiently yourself. If you convert them to IN-LINE code, you may be able to optimize the machine code directly. A considered attack like this will give you the most improvement for your time investment.

TIPS ON INCREASING SPEED If you suspect a section of code is taking a lot of time, you can add some code to your program to time it yourself. You may also want to extract the section into a small separate program for testing. The system clock only offers a resolution of 1/18.2 seconds, so you should time multiple iterations of the routine to get an accurate measure of its speed. Figure 1 shows a simple timer routine, and Figure 2 shows the timer routine in use. Clearly this method is most useful for comparing two different ways to accomplish the same task. If you have a slow routine, try to think of different ways to accomplish the same task. Then time them all and select the fastest.

A few general techniques are useful in writing faster algorithms. Succ and Pred are faster than +1 and -1. Addition and subtraction are faster than multiplication and division. Integer arithmetic is faster than floating-point arithmetic. To initialize a large array variable, use the FillChar procedure rather than looping and assigning every value individually. You can initialize record variables or any type of variable with FillChar.

Look at all your loops. If there's anything inside the loop that you don't have to calculate on every pass, you'll save time and lose nothing by moving it outside the loop. Are you calling any small procedures or functions in loops with many iterations? If so, consider inserting the code of the procedure directly in the loop. The 10,000 iterations of a very simple procedure I tested took 0.88 seconds, but with the code moved directly into the loop it took 0.28 seconds. The table "Turbo Pascal Speed-up Techniques: Optimizing Code for Faster Execution" illustrates some of these simple techniques, and when you make

some timing tests of your own, you'll find more items to add to the list.

STRING ROUTINES You can improve on the speed of Turbo Pascal's built-in string routines if you're willing to give up a little flexibility. For example, to get the length of a string, it's a great deal faster to use Ord(MyString[0]): than the built-in Length(MyString):. Note, however, that you can't use the Ord technique on a function result. It refers directly to a particular character in the string (the length byte) and you can't do that with a function result. Thus, for instance,

Length(StringA+StringB);

is perfectly legitimate, but

Ord((StringA+StringB)[0]);

won't even compile.

For another example, instead of Delete(S, 1, 1);, you can substitute

```
MOVZ(S[2], S[1], pred(ord(S[0]));
S[0] := Pred(S[0]);
```

```
(***** Include this file in your program as TIMER.INC. *****)
(* A typical use of the routine would look like this: *)
(* timer(on); *)
(* FOR I := 1 TO 10000 DO {something}; *)
(* timer(off); *)
(* Write('10,000 repetitions of {something} took '); *)
(* WriteLn(time1:2, ' seconds. '); *)
(*****)

TYPE OnOff = (on, off);
VAR start, time : Real;

PROCEDURE timer(O : OnOff);
TYPE
  Registers = RECORD
    CARS : Integer OF
      1 : (AL, BX, CX, DX, BP, SI, DI, OR, SS, Flags : Integer);
      2 : (AX, AR, BU, BR, CL, CH, OL, OH : Byte);
  END;
VAR
  R : Registers;
```

```
hour, min, sec, hun : Integer;
BEGIN
  R.AH := $2C;          (* 2C is the Get Time function *)
  INC(DI, R);           (* call interrupt *)
  WITH R DO
    BEGIN
      hour := CB;
      min := CL;
      sec := DR;
      hun := OL;
    END;
  IF O = On THEN
    BEGIN
      start := hour*3600 + min*60 + sec + hun/100;
      time := 0;
    END
  ELSE
    BEGIN
      time := hour*3600 + min*60 + sec + hun/100 - start;
      start := 0;
    END;
END;
```

Figure 1: A simple timer routine that uses the DOS Get Time function.

```
PROGRAM Test Length;
CONST Reps = 10000;
VAR
  S : string[255];
  B : byte;
  N : integer;
  {$I timer.inc}

BEGIN
  timer(on);
  FOR N := 1 TO Reps DO B := length(S);
  timer(off);
```

```
Write(Reps, ' repetitions of "length(S)" took ');
WriteLn(time1:2, ' seconds');
timer(on);
FOR N := 1 TO Reps DO B := ord(S[0]);
timer(off);
Write(Reps, ' repetitions of "ord(S[0])" took ');
WriteLn(time1:2, ' seconds');
END.
```

```
OUTPUT:
10000 repetitions of "length(S)" took 6.87 seconds
10000 repetitions of "ord(S[0])" took 0.21 seconds
```

Figure 2: Using TIMER.INC to compare the speed of two ways of measuring string length.

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Turbo Pascal Speedup Techniques:
Optimizing Code for Faster Execution

SLOW

```

X := 2*X;

X := X + 1;

FOR I := 1 to 100 DO
  X[I] := I + (J*K);

PROCEDURE AssignX(Y : integer);
BEGIN
  X[Y] := Y;
END;

FOR I := 1 to 10000 DO AssignX(I);

FOR I := 1 to 10 DO
  FOR J := 1 to 100 DO
    X[I][J] := 0;
  
```

FAST

```

X := X + X;

X := Succ(X);

L := J*K;
FOR I := 1 to 100 DO
  X[I] := I + L;

FOR I := 1 to 10000 DO X[I] := I;

FillChar(X, SizeOf(X), 0);
  
```

Notice that the faster code no longer visibly refers to deleting characters from a string. In speeding up the code, we've lost clarity. If you use a function like the above, be sure to comment it extensively, e.g.,

```

(* Code to delete the first char from a string.
   It moves all the chars starting with the second
   down one position. The number of chars to move
   is one less than the length. After the move,
   reduce the length by one. WARNING: will crash
   if used on an empty string. *)
  
```

If you use only variables as arguments, you can improve the speed of almost all the string functions.

INTEGERS, NOT BYTES Interestingly enough, integer variables are essentially more efficient than bytes. The two-byte integer is the basic data type of the 808x processor, and it actually takes extra work to use just one byte. The example in Figure 3 shows a disassembly of two identical functions, one using bytes and the other integers. The byte-based function generated two instructions that the integer version didn't require. Replacing bytes with integers will save about twice as many bytes of code as there are references to byte-sized variables. It will add to the data and stack space required, but only by one byte per variable declaration.

LOOK UP, DON'T CALCULATE Suppose that in order to do a bit comparison on integers you need a function that returns powers of 2 from 0 to 15. Your first attempt might look like the function Power_2 in Figure 4. Just multiply 2 by itself *N* times. This could really take a long time if the power were large, but in this case we know it won't be over 15. Given the limited domain of the function, we can create the function Power_2a that does no calculation whatever. Power_2a just looks up the required value in the array Power2.

There is a certain overhead for calling a function, both in time and code size, however, so you should avoid one line functions like Power_2a. Thus, to save both time and size still further, you should cut out the function and reference the array Power2 directly. As you can see by the results in the figure, this is nearly 25 times faster than the original function!

FASTER CASE STATEMENTS CASE statements are efficient in Turbo Pascal, but you can make them more so. First, if the cases are not all called with equal frequency, you can save time by putting the most-often-called ones at the top. Second, you can save code by taking advantage of

the fact that Turbo Pascal bends the standard requirements for case labels. Niklaus Wirth's Pascal requires case labels to be unique, but Turbo Pascal does not. Figure 5 shows an example of possible code savings this way. Turbo Pascal applies the CASE tests sequentially and selects the first one that matches. It doesn't matter that a TAB character matches both its own specific label and the 0..31 label, because the 0..31 test doesn't occur.

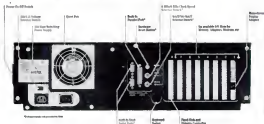
REDUCING CODE SIZE To know when to optimize for size, you must be able to measure the code being created. It's easy enough to gauge the size of a procedure, as Figure 6 illustrates. If you need to count the bytes created by a particular Turbo Pascal statement, you can use a standard debugger, as described below.

COMPILER DIRECTIVES Turbo Pascal allows you 64K of code space for any program. If you're running into this limit, the first thing you can do is set the compiler directives to make Turbo generate substantially less code. If you put

```
{SR-, K-, V-}
```

at the top of your program you'll disable

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■ PC LAB NOTES

<pre> FUNCTION TwiceB(B : byte) : byte; BEGIN TwiceB := B*2; END; FUNCTION TwiceI(I : Integer) : Integer; BEGIN TwiceI := I*2; END; </pre>	<pre> E90000 JMP 2077 8A4694 MOV AL,[BP+04] 32E4 XOR AH,AH ;<===== B90200 MOV CX,0002 F7E9 IMUL CX 004696 MOV [BP+06],AL E90000 JMP 20E7 8A4696 MOV AL,[BP+06] ;<===== 32E4 XOR AH,AH 8B05 MOV SP,BP 50 POP BP C03000 RET 0003 </pre>	<pre> E90000 JMP 2099 8B4694 MOV AX,[BP+04] B90200 MOV CX,0002 F7E9 IMUL CX 004696 MOV [BP+06],AX E90000 JMP 2DA7 8B4696 MOV AX,[BP+06] 8B05 MOV SP,BP 50 POP BP C04000 RET 0004 </pre>
<pre> TwiceB ----- TwiceI 55 PUSH BP 55 PUSH BP 8BEC MOV BP,SP 8BEC MOV BP,SP 55 PUSH BP 55 PUSH BP </pre>	<pre> 34 bytes </pre>	<pre> 30 bytes </pre>

Figure 3: References to integer variables generate less code than do references to byte variables.

<pre> ***** PROGRAM PowerOf2; CONST Power2 : array[0..15] of Integer = (1,2,4,8,16,32,64,128,256,512,1024,2048,4096,8192,16384,00000); VAR N : byte; Temp : Integer; BEGIN Temp := 1; FOR N := 2 to I DO Temp := Temp * 2; Power2 := Temp; END; FUNCTION Power_2e(I : Integer) : Integer; BEGIN Power_2e := Power2[I]; END; </pre>	<pre> BEGIN K := 15; timer(on); FOR I := 1 to reps DO J := Power_2(K); timer(off); Write('Power_2 took ',time:1:2); WriteLn(' seconds for ',reps,' repetitions'); timer(on); FOR I := 1 to reps DO J := Power_2e(K); timer(off); Write('Power_2e took ',time:1:2); WriteLn(' seconds for ',reps,' repetitions'); timer(on); FOR I := 1 to reps DO J := Power2[K]; timer(off); Write('Power2 array took ',time:1:2); WriteLn(' seconds for ',reps,' repetitions'); END; OUTPUT: Power_2 took 9.56 seconds for 10000 repetitions Power_2e took 1.37 seconds for 10000 repetitions Power2 array took 0.39 seconds for 10000 repetitions </pre>
---	--

Figure 4: Successive optimizations of a power-of-2 routine.

<pre> (* This case statement lists all the case labels in numeric order. There is no overlap -- a given character matches one and only one case. If MyChar is an ordinary alphanumeric character, the program will make 10 comparisons before matching it. SLOWER!*) CASE Ord(MyChar) OF 8..7 : Do_Control_char; 8 : Do_Backspace; 9 : Do_Tab; 10 : Do_LF; 11,12 : Do_Control_char; 13 : Do_CR; 14..26 : Do_Control_char; 27 : Do_Escape; 28..31 : Do_Control_char; 32..127 : Do_Lower_ASCII; ELSE Do_Upper_ASCII; </pre>	<pre> END; (* This case statement lists its labels in order from most often used to least. If MyChar is alphanumeric, only one comparison will be required. Also, by letting the special control characters overlap the general case for control characters, it reduces the total number of labels required. FASTER!*) CASE Ord(MyChar) OF 32..127 : Do_Lower_ASCII; (Most frequent first) 10 : Do_LF; 13 : Do_CR; 8 : Do_Backspace; 9 : Do_Tab; 27 : Do_Escape; 28..31 : Do_Control_char; (Overlaps) ELSE Do_Upper_ASCII; END; </pre>
---	---

Figure 5: Optimizing a CASE statement by adjusting its labels.

Range Checking, Stack Checking, and Var-parameter Type Checking, respectively. (The R— isn't strictly necessary, since this one is off by default, but include it as a reminder.)

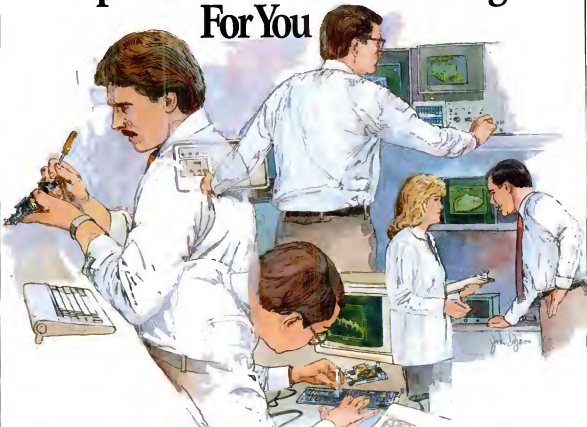
As usual, however, there's a trade-off.

The "extra" code these directives generate provides often-useful protection. Thus, you have to be very sure that your program is free of hidden bugs before you remove the protective checks. If you write outside the bounds of an array or run out of stack

space, you'll have no warning with these directives off.

You can also turn off the {\$I—} directive to cut out I/O error checking. However, if you delete this check you will need to rewrite parts of your program. Specific-

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On April 2, IBM made PC history. Eight weeks later, we rewrote it.

IDEAssociates Is the First Out of the Gate with 5251 Emulation Board for PS/2

By Rob Garretson

BILLERICA, MA.—IDEAssociates Inc. has introduced a 5251 emulation board for the IBM PS/2, beating IBM out of the blocks by five months in the race to connect the new micros to its System/36 and System/38 minicomputers.

The new IDEAcomm 5251/MC, which will be available to users next month, is compatible with IBM's Micro Channel Architecture used in the PS/2 Models 50, 60 and 80, according to Cathy Eftimiou, an IDEAssociates marketing manager for communications products. The new board connects the PS/2 via twinaxial cable to a System/3X or controller and allows the PC to emulate an IBM 5251, 5291, 5292 or 3180 terminal.

IBM's System 36/38 Workstation Emulation Adapter/A for connecting a PS/2 to a System/3X is not scheduled for availability until next year. Other third-party companies, including Digital Computer Systems and the PC



IDEAssociates will be the first to ship this time with the board.

Channel from the quick made possible use of a new board uses a twin-

axial cable to connect Micro Channel-compatible microcomputers to the S/3X or to a System/36 or 5251 controllers. It will allow users to emulate IBM 5251, 5291, 5292 and 3180 terminals. It can be used with either a color or monochrome monitor.

Cathy Eftimiou, a spokeswoman for IDEAssociates, said the new board is fully compatible with the Micro Channel architecture.

IDEAssociates 1st To Link PS/2

BILLERICA, Mass.—IDEAssociates Inc. said last week that it would be the first company to deliver a 5251 emulation board connecting IBM's Personal System/2 Models 50 and 60 with System 34/36/38s.

Scheduled to begin shipping in May, the company's IDEAcomm 5251/MC (Micro Channel) will allow IBM 3180 emulation capabilities including support for windows with multiple sessions, IDEAssociates

April 2, 1987.

To most computer add-on companies that was the date IBM dropped the bomb. With the introduction of PS/2 personal computers, the Micro Channel™ revolution had begun.

The effect on our competitors? Many were prepared to do little more than count big inventories of emulation products for old PCs.

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The result of these efforts is an add-on board that redefines the limits of PC communications. It provides 5292 Model 2 emulation. Support for 132 columns in 3180 emulation. And windows to monitor the real time status of multiple sessions on one PC screen. Q38 Technical Journal declared, "... while IDEAssociates is delivering an emulation card that works completely, the other guys are just playing catch-up."

Which, historically speaking, is exactly the position we're inclined to take. For more information on the IDEAcomm 5251/MC, call 800-257-5027.

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■ PC LAB NOTES

```
{SR+}
PROGRAM Size_Example;

FUNCTION Example(I : integer) : Byte;
BEGIN
  Example := I;
END;

PROCEDURE NextProcedure; BEGIN END;

BEGIN
  Write('The SIZE of the function "Example" is ');
  WriteLn(ofs(NextProcedure) - ofs(Example), ' bytes. ');
  Write('Change the {SR+} at the top to {SR-} ');
  WriteLn('and see the size reduction. ');
END.
```

Figure 6: Measuring the compiled size of a procedure.

ly, you will have to check the built-in variable `IOResult` explicitly after file I/O operations.

SHRINKING SPECIFIC ROUTINES

Reductions in size won't be as dramatic as those in execution time. Because some routines are repeated thousands of times, however, even a tiny improvement can make a vast difference in speed. Choosing efficient algorithms is the secret to effecting the biggest size reductions. Thus, if you've found a section of code that needs to die, consider whether there aren't other ways to accomplish the same thing. If you can find several methods, create a test program and measure them all. You may find a better way. Do note that most of the quick techniques shown in the table "Turbo Pascal Speedup Techniques" reduce size as well as execution time.

Use CASE statements rather than multiple IF statements. Turbo has to compile each IF statement as if it were standing alone. It can't take advantage of the fact that the series of statements are related. A CASE statement makes the relationship clear, and so lets the compiler generate more-efficient code. As shown in Figure 5, you can use overlapping case ranges to reduce the number of comparisons required in a case statement.

DOING YOUR OWN DISASSEMBLY

If you have some knowledge of assembler, you can disassemble the code produced by the compiler and hand-optimize it. You'll

put the result either in the form of Turbo `INLINE` statements or in an `EXTERNAL` procedure. I prefer the `INLINE` method, because you can directly refer to global and local variables by name without worrying about their addresses. There are a number of ways to obtain a disassembly of a Turbo procedure.

The brute-force method is to insert a marker of some kind at the procedure in which you're interested. Compile the program to disk, call up the .COM file under `DEBUG`, and Search for the marker. This marker could be in the form of a literal string. If you insert the line `Write('MARKER')`, you can search the .COM file for the string `MARKER`.

Another way to insert a marker is to use `NOPs`. The byte `$90` represents the assembler op-code `NOP`—it is a no-operation, a do-nothing. You can insert

```
INLINE ($90/$90/$90);
```

for example, and then search the .COM file for the three `NOPs`.

Finally, if you're willing to look up the letters of your marking phrase in the ASCII table, you can insert `INLINE` code consisting of those bytes, preceded by an instruction to jump `OVER` them. The code

```
INLINE ($EB/$07/$48/$69/$2B/$6D/$6F/$D1);
```

will insert the string `Hi Mom!` into your compiled program. The two machine code bytes `$EB/$07` are an instruction to `JUMP 7 bytes ahead`—right over the marking phrase.

WILY WAYS WITH OVERLAYS

There is a more subtle way to get a disassembly of a procedure. Assuming your program does not use overlays, just put the `OVERLAY` keyword in front of the declaration of the desired procedure. Then compile the program, in memory or to disk. Now, if you had called the program `MYPROG.PAS`, you'll find `MYPROG.000` on the disk. Use `DEBUG` to unassemble the .000 file. The first 7 bytes are special code used in overlays, but after that comes the disassembly of the procedure itself. Figure 7 shows this technique applied to an empty procedure. The figure also shows that

LAB NOTES BY MODEM

The programs published in *PC Magazine* can be downloaded by modem from the PC Magazine Interactive Reader Service. There is no charge for this service, but users are cautioned that these programs are copyright material and are made available only for individual, non-commercial use. You may make copies for others (including placement on non-commercial electronic bulletin boards), as long as no charge is involved. However, making copies for any commercial purpose is strictly prohibited.

The Eastern modem number for PC-IRS is (212) 696-0360. In the West, call

(415) 598-9100. Use 2400/1200/300 bps, 8 data bits, 1 stop bit, no parity. Files with a .COM, .EXE, or .ARC extension require use of the Xmodem error-checking protocol; files with .ASM or .BAS extensions can be downloaded using either regular ASCII or Xmodem.

Figures 1 through 11 and Figure A of this issue's PC Lab Notes are available for downloading. In addition, you can also download `PROFILE.COM`, `INLINE.COM` (there are shareware offerings, both of which are in .ARC form), and `FASTWR.PAS`, all of which are cited in the article.

■ PC LAB NOTES

```

debug MYPROG.000
-u 100
5B22:0100 EBF8DE      CALL     DFFB      ; OVERLAY
5B22:0103 1200        ADC      AL,[BX+SI] ; system
5B22:0105 892D        MOV      [DI],BP ; code
5B22:0107 55         PUSH     BP      ;c== Procedure begins here
5B22:0108 8BEC        MOV      BP,SP
5B22:010A 55         PUSH     BP
5B22:010B E90000      JMP      010E
5B22:010E E90000      JMP      0111
5B22:0111 8BE5        MOV      SP,BP
5B22:0113 5D         POP      BP
5B22:0114 C3         RET

```

Figure 7: Disassembly obtained after turning a procedure into a fake overlay.

without even doing anything, a procedure takes 14 bytes of code.

TOOLS FOR OPTIMIZING So far I've discussed techniques you can try right away, using only the Turbo compiler and

possibly DEBUG. To go further with optimizing, you should consider purchasing some of the software programs listed in the accompanying sidebar "Turbo Pascal Optimizing Tools." The list is not exhaustive, but it is representative. You'll spend a

little money on these, but they'll make your task faster and easier.

PROFILERS Consider two procedures. One takes 30 seconds to complete, the other only 1 second. Which procedure do you optimize? Now stipulate that the program calls the first once and the second 10,000 times. Clearly, the total time spent in a procedure determines how much benefit that you'll get by optimizing. Speeding up the first procedure by a factor of 10 gains you 27 seconds. Doing the same to the other gains 9,000 seconds, or 2½ hours. Optimizing that one procedure might make the difference between a viable program and a dog.

A *profiler* is a software tool that analyzes your program while it's executing and determines which areas of the code are called most frequently. There are a number

TURBO PASCAL OPTIMIZING TOOLS

Program Execution Profiler

Program Execution Timer

TurboPower Software
3109 Scotts Valley Dr
Scotts Valley, CA 95066
(408) 438-8608

List Price: \$95 (with source).

Requires: 96K RAM, two disk drives, Turbo Pascal 3.0 or later, DOS 2.0 or later.

In Short: Two profiling utilities created specifically for Turbo Pascal. The first is a standard profiler, producing a histogram of program activity. The second reports on the time spent in each procedure and function of the program. Not copy protected.

CIRCLE 600 ON READER SERVICE CARD

TDebugPLUS

TMAP

TurboPower Software
3109 Scotts Valley Dr
Scotts Valley, CA 95066
(408) 438-8608
List Price: \$60

Requires: Two disk drives, Turbo Pascal 3.0 or later, DOS 2.0 or later.

In Short: TMAP is a part of the TDebugPLUS package. It generates a standard MAP file, which symbolic debugging programs require. Not copy protected.

CIRCLE 601 ON READER SERVICE CARD

PROFILE.COM

Pete Becker
The Toolmakers
P.O. Box 8976
Moscow, ID 83843

CompuServe ID: 76347.3151

List Price: Shareware, \$10 registration.

Requires: Turbo Pascal 3.0 or later.

In Short: PROFILE is specific to Turbo Pascal and reports results much like the Program Execution Profiler does. You can download it from Borland's CompuServe Forum (GO BORPRO) or from PC Magazine's IRS. Not copy protected.

CIRCLE 602 ON READER SERVICE CARD

Profiler

DWB Associates
P.O. Box 5777
Beaverton, OR 97006
(503) 646-5607

List Price: \$125

Requires: DOS 2.0 or later, RAM-resident portion occupies 3K.

In Short: This is a general-purpose profiler. You can specify any range of memory to be profiled and even profile RAM-resident programs. Includes source (MSC and ASM86). Not copy protected.

CIRCLE 603 ON READER SERVICE CARD

Software Performance and

Timing Analyzer

ATRON
20665 Fourth St.
Saratoga, CA 95070
(408) 741-5900

List Price: \$129

Requires: ATRON Software Source Probe (\$129).

In Short: A more expensive choice, but you get both symbolic debugging and pro-

filling. With a MAP file, it gives timing of procedures by name and counts the number of executions of a given instruction. Not copy protected.

CIRCLE 604 ON READER SERVICE CARD

INLINE.COM

UNINLINE.COM

Dave Baldwin
22 Fox Den Rd.
Hollis, NH 03049
(603) 465-7857

CompuServe ID: 76327.53

List Price: No fee. To get a copy from the author, send \$5 for handling.

Requires: Turbo Pascal 3.0 or later, DOS 2.0 or later.

In Short: Valuable tools to convert ASM code to Turbo Pascal INLINE format or vice versa. Can be downloaded from Borland Forum of CompuServe (GO BORFORUM) or PC Magazine's IRS. Not copy protected.

CIRCLE 605 ON READER SERVICE CARD

Turbo Optimizer

TurboPower Software
3109 Scotts Valley Dr
Scotts Valley, CA 95066
(408) 438-8608

List Price: \$75, or \$125 with source.

Requires: Turbo Pascal 3.0 or later, DOS 2.0 or later.

In Short: Includes Turbo Object Optimizer (automatic "peephole optimization" of your programs), Turbo Library Compactor (throws out unused code), and Turbo Object Librarian (stores compiled procedures for fast access). Not copy protected.

CIRCLE 606 ON READER SERVICE CARD

of such profilers available for Turbo Pascal. Usually the profiler displays a bar chart of program activity, with long bars representing the hot spots, as shown in Figure 8. On the first pass, the long bars will represent large chunks of code, so most profilers let you narrow your focus and try again. When you've got a detailed list of the busy areas in your code, leave the profiler and bring up Turbo Pascal again.

To find the source code lines corresponding to the hot spots, load your program into Turbo Pascal and use the OF (Options Find) command. Enter the beginning address and let Turbo Pascal find the corresponding source line. Do the same with the ending address. Now you've found an area that could use some optimizing. Note that if Turbo fails to find the source line, it means the offset you entered was within the Turbo Run Time Library. Since that's beyond your control, concentrate on another area.

LIBRARIES If you'd prefer to exercise your creative talents devising new programs rather than squeezing bytes and microseconds out of old ones, you can buy libraries of preoptimized routines for Turbo Pascal. By using these routines you can speed up and slim down your programs without spending a lot of time. The special case for using library routines for video I/O is discussed in the sidebar "Turbo Pascal Video Routines," and a number of applicable programs are listed in the sidebar "Library Routines."

In evaluating a library for your use, first be sure that it offers all the routines you need. Look for one that keeps each routine in a separate file—there's no point in switching to a smaller "delete" procedure if you then have to add 50 other procedures along with it. And look for routines coded in *INLINE* or *EXTERNAL* assembler. If it seems odd to optimize Pascal by using assembler, consider the fact that the entire Run Time Library is assembler code.

SYMBOLIC DEBUGGERS You may never need to use a symbolic debugger. You can do almost anything you'll ever need to do with a Turbo program without one. But if you want to analyze exactly what code the compiler generates for each

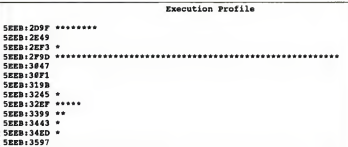


Figure 8: A typical output using *PROFILE.COM*.

line of your source code, a symbolic debugger is the only reasonable tool.

These programs show you the machine code produced by compiling your program interspersed with the source lines that generated it. Variables appear by name, as do calls to the Run Time Library. However, the debugger gets the information about variable names and source lines from a .MAP file, and the Turbo compiler doesn't produce such a file. Fortunately, TurboPower Software distributes a program called TMAP with their *TDebugPLUS* package. TMAP creates a standard .MAP file for any Turbo Pascal program.

ATRON, *Periscope*, and *SYMDEB* will all work with the .MAP file generated by TMAP. By looking at the debug display along with the source code, you can see exactly what instructions each line of code produces. Figure 9 shows a symbolic disassembly of the heart of the Sieve routine that is listed in Figure 10.

AUTOMATED OPTIMIZING At present there is only one package devoted to automatically optimizing Turbo Pascal programs. This is the *Turbo Optimizer*, from TurboPower Software. The *Optimizer* consists of three parts, the Turbo Object Optimizer (TOPT), the Turbo Library Compactor (TLC), and the Turbo Object Librarian (TOL). TOPT removes unnecessary instructions, and TLC removes unused code. You may be surprised to find that a Turbo Pascal program has either, but there are reasons.

By generating a little more code than is absolutely necessary, Turbo is able to compile programs in one fast pass. For ex-

LIBRARY ROUTINES

Mac2

MicroHelp
2220 Carlyle Dr.
Marietta, GA 30062
(404) 973-9272
List Price: \$69

Requires: 128K RAM, one disk drive, Turbo Pascal 3.0 or later, DOS 2.0 or later.
In Short: An extensive collection of routines. Most are written in assembler, either as *INLINE* code or external files. Includes an *INLINE* assembler program, with source code. Not copy protected.

CIRCLE 887 ON READER SERVICE CARD

Turbo Power Tools Plus

Blaine Computing Inc.
2560 Ninth St., #316
Berkeley, CA 94710
(415) 540-5441
List Price: \$99.95

Requires: Two disk drives, Turbo Pascal 2.0 or later, DOS 2.0 or later.
In Short: A set of Turbo Pascal routines especially featuring code to create RAM-resident programs. Not copy protected.

CIRCLE 888 ON READER SERVICE CARD

Turbo Pascal Express

By Robert Jourdain
Prentice-Hall Inc.
Division of Simon & Schuster Inc.
200 Old Tappan Rd.
Englewood Cliffs, NJ 07675
(201) 767-5049
List Price: \$39.95
Copyright: 1987

Requires: Turbo Pascal 3.0 or later.
In Short: This book/disk combination offers 250 routines and explains how to create your own. Not copy protected.

CIRCLE 889 ON READER SERVICE CARD

■ PC LAB NOTES

TURBO PASCAL VIDEO ROUTINES

Turbo Pascal programs are fast, but they don't speed up the BIOS screen output. You can gain a lot of speed by bypassing the BIOS. The video RAM is located at segment \$B000 for monochrome, \$B800 for color. It's tempting to write your own routines that just shove character/attribute pairs into those memory areas.

Unfortunately, the IBM standard CGA needs special treatment. If you access the video RAM during the time when the electron beam is writing to the screen, you get an ugly flickering effect, like snow on your TV. The way to avoid the snow is to only access the video RAM during the time when the beam is tracing back to start another writing pass. To write such a routine, you'll need an IBM *Technical Reference* manual (or equivalent) and lots of patience.

This is a case where you can save time by using a prewritten, optimized routine. Most commercial Turbo Pascal libraries include a fast screen output routine. Most electronic bulletin board systems (BBS) that have a Turbo Pascal section will also offer one or more fast screen-writing routines. One freely available example is FASTWR.PAS, available on the Borland CompuServe Forum (GO BOR-PRO) or from *PC Magazine's* IRS. FASTWR.PAS includes routines to write strings, to change the attribute of an area, and to save and restore portions of the screen, all without snow.

The commercial libraries usually have further elaborations on the fast video-writing concept. For example, the *Mach 2* collection includes everything in FASTWR, plus the ability to draw a line

of repeated characters either across or down, to draw a box instantly, or to create an "exploding" box. It also includes a set of routines devoted to a very impressive window management scheme.

Blaise Computing's *Turbo Power Tools Plus* naturally includes the snow-free fast writing and windowing routines. The very special feature of *Power Tools* is its support of RAM-resident programs. Using the routines supplied, you can build your own "SideKick-like" programs that pop up at the touch of a "hot key." Blaise supplies examples, including an alarm clock and a modest keyboard macro program.

Turbo Pascal Express takes a different approach. It is basically a large book, with two disks containing the routines bound into the back. Among *Express's* 250 INLINE routines are some, like Fastwrite, that write directly to video RAM. Additional routines elaborate on

the idea, providing left, right, or center justification and vertical writing. Another set of routines creates text graphics such as boxes on the screen.

Express concludes with a detailed chapter on how to write your own fast routines. The author not only provides the necessary information to create high-speed INLINE code, he also provides an INLINE assembler program on disk. This program converts .ASM files to Turbo Pascal INLINE format and is similar to the INLINE.COM program that is available on the PC-IRS.

Figure A shows the way to call each library's fast-writing routine. As you can see, they're almost the same. When you're shopping for a library, collect lists of features and compare the items that are not shared by all. Which of these will you need most? The shared ones are likely to be very similar, so concentrate on the differences.—Neil J. Rubenking

```
MyString := 'NOW, am I ever FAST!';

Using FASTWR.PAS:

  FastWrite(MyString, 5, 10, $4E);

Using Mach 2:

  Mh_PutStr(10, 5, MyString, $4E);

Using Turbo Power Tools Plus:

  _writeScn(10, 5, Addr(MyString[1]), Length(MyString), $E, 4, 0);

Using Turbo Pascal Express:

  Display(MyString, 10, 5, $4E);
```

Figure A: Four approaches to direct video-RAM writing.

ample, at the beginning of every procedure it inserts a JMP statement. If the procedure contains any typed constants or nested procedures, Turbo inserts the address of the first instruction of the main procedure. Otherwise, it simply leaves it as a "null jump," i.e., a jump to the very next instruction. This jump isn't necessary, but Turbo couldn't know that until later, and removing it would require carefully relo-

cating all the code generated after that jump. Turbo saves time by leaving the null jump still inside the code.

In the disassembly shown in Figure 9 you'll see an example of another kind of unnecessary instruction. The source line A11 is K := I + I; and the next line, A13, is Sieve[K] := False;. The last instruction in the code generated by line A11 puts the value of the AX register into

K. The first instruction of the next line puts the contents of K into the AX register. You and I can see that AX already has the correct value; there's no need to reload it. But a one-pass compiler usually doesn't resolve this kind of redundant code.

TOPT walks through the code, breaking it down into logical blocks. Within each block it notes any unnecessary instructions. Then it relocates the rest of the

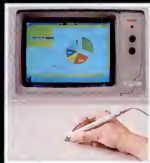
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■ PC LAB NOTES

<pre> A7: FOR I := 2 TO Max DIV 2 DO (only have to go to halfway mark) 6233:2D7F B80200 MOV AX,B802 6233:2D82 59 PUSH AX 6233:2D84 8B0E03 MOV AX,03EF 6233:2D86 B80200 MOV CX,B802 6233:2D89 99 CWD 6233:2D8A F7F9 IDIV CX A8: BEGIN 6233:2D8C 59 POP CX 6233:2D8E 91 XCHG CX,AX 6233:2D90 2BC8 JNB CX,AX 6233:2D92 70D3 JGE D095 6233:2D94 F34B00 JMP A18 6233:2D95 41 INC CX 6233:2D96 A34A06 MOV [I],AX 6233:2D98 51 PUSH CX A9: IF Sieve[I] THEN (IF I has not yet been eliminated) 6233:2D9A A34A06 MOV AX,[I] 6233:2D9C 91 XCHG DI,AX 6233:2D9E 6A854102 MOV AL,[DI+261] 6233:2DA2 32E4 XOR AH,AX </pre>	<pre> 6233:2DA4 8BC8 OR AX,AX 6233:2DA6 7503 JNZ A11 6233:2DA8 E32A00 JMP A17 A11: 6233:2DAA A14A06 MOV K := I+1; (K starts as first multiple of I) 6233:2DAE 8B0406 ADD AX,[I] 6233:2DB2 A34C06 MOV [K],AX A13: 6233:2DB5 A14C06 MOV AX,[K] 6233:2DB8 97 XCHG DI,AX 6233:2DBA 8B0800 MOV AX,B808 6233:2DBD 8B561802 MOV [DI+826],AL A14: 6233:2DBF A14C06 MOV AX,[K] 6233:2DC3 8B0406 ADD AX,[I] 6233:2DC7 A34C06 MOV [K],AX A15: 6233:2DCA A14C06 MOV AX,[K] 6233:2DCD 30E003 CHF AX,#0E0 6233:2DD0 7FE3 JG A17 6233:2DD2 E900FF JMP A13 A17: END; </pre>
--	---

Figure 9: Symbolic disassembly from the program in Figure 10.

<pre> PROGRAM DoSieve; CONST Max = 1000; VAR Sieve : ARRAY[1..Max] OF Boolean; I, K : Integer; BEGIN FillChar(Sieve, SizeOf(Sieve), True); FOR I := 2 TO Max DIV 2 DO (only have to go to halfway mark) BEGIN IF Sieve[I] THEN (IF I has not yet been eliminated) BEGIN K := I+1; (K starts as first multiple of I) </pre>	<pre> REPEAT Sieve[K] := False; K := K+1; (More multiples of I) UNTIL K > Max; END; END; WriteLn('CALCULATION COMPLETE! Prints to ',Max,' area:'); FOR I := 1 TO Max DO IF Sieve[I] THEN Write(I:8); END. </pre>
--	---

Figure 10: The Sieve of Eratosthenes program disassembled in Figure 9.

<pre> PROGRAM Empty; PROCEDURE Nothing; BEGIN INLINE(\$98); END; BEGIN Nothing; END. </pre>	<pre> 56B7:2D77 90 NOP 56B7:2D78 F90000 JMP 2D7B 56B7:2D7B 8BE5 MOV SP,BP 56B7:2D7D 5D POP BP 56B7:2D7E C3 RET </pre>
<p>Disassembly of procedure Nothing before optimization:</p> <pre> debug nothing.com -u 2d71 56B7:2D71 8BEC MOV BP,SP 56B7:2D73 55 PUSH BP 56B7:2D74 E90000 JMP 2D77 </pre>	<p>Disassembly of procedure Nothing after optimization:</p> <pre> debug nothing.com -u 2d71 56B7:2D71 8BEC MOV BP,SP 56B7:2D73 55 PUSH BP 56B7:2D74 90 NOP 56B7:2D75 8BE5 MOV SP,BP 56B7:2D76 5D POP BP 56B7:2D77 5D POP BP 56B7:2D78 C3 RET </pre>

Figure 11: An example of TOPT's optimization.

code to eliminate those instructions. An example of TOPT operation is shown in Figure 11. The result is a .COM file that's smaller and faster. And all you had to do was run the program!

For a simple line like $X = X + 1$; the Turbo compiler simply generates the corresponding machine code. Other operations actually calls to special routines built into every Turbo program. Collectively these routines constitute the Run Time Library (RTL). They include all file and string functions, floating-point arithmetic, memory management, and more.

One of Turbo's signal accomplishments is that it squeezes all these functions into only 11.5K.

However, that 11.5K appears in every program you compile. You may be using only a tenth of the routines in the RTL, but they're all there, taking up space. TLC cuts out the portions of the RTL that you don't use. The size savings TLC produces are incredible. A simple program might easily shrink from 15K to 5K. TurboPower supplies some examples showing techniques for writing programs that TLC will reduce to under 1K!

The message is clear: optimize all your programs. They'll load quicker, run faster, and take up less space on disk. Definitely optimize programs other people will use, but do it just for yourself, as well. You'll not only appreciate the added efficiency, but you'll hone your programming skills at the same time. We computer users are always demanding more speed from our hardware. Why expect less from our software?

Neil J. Rubenking is a contributing editor of PC Magazine.



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With STICK.COM you can keep the cursor size and shape you set with last issue's CTYPE utility and never have to boot up your EGA-equipped system in monochrome again.

The CTYPE utility presented in last issue's Utilities column lets you set your cursor to nearly any configuration supported by your video hardware. As many dieters have discovered, however, achieving a specific size and shape is one thing; keeping it is another. Many applications cause the cursor set with CTYPE to revert to its standard underline form at the first opportunity—until, that is, you lock it in with STICK.

STICK goes beyond just letting you keep your CTYPE cursor, however. The bugs in IBM's EGA BIOS (faithfully reproduced by other EGA boards to ensure compatibility), which often cause the cursor to disappear when more than 25 lines of text are displayed, simply cry out for a thorough software fix. So STICK.COM contains its own EGA cursor emulation code, which hooks into interrupt 10h and effectively replaces the defective BIOS code. In addition to cursor locking, then, STICK gives you direct control over the state of the BIOS cursor emulation bit, the flag that enables and disables emulation altogether. And since it's forced to grab the video interrupt anyway, STICK throws in the few extra bytes of code necessary to provide yet another simple fix for the colorless DOS interface. With this feature you can start—and stick with—the foreground and background color combination of your choice.

The easiest way to get a copy of STICK is to download it from the PC Magazine Interactive Reader Service, as explained in the sidebar "STICK by Modem." Both the assembly language source code,

STICK.ASM, and STICK.BAS, a BASIC program that will create the command for you, are listed elsewhere in this article and are also available via PC-IRS.

USING STICK STICK is a resident utility that requires a mere 560 bytes of memory after installation. Entered at the DOS prompt or as a line in your AUTOEXEC.BAT file (preceded by any necessary drive and path designation if you locate STICK.COM in another directory or drive), its syntax is

STICK [/L+/-] [/R+/-] [/B+/-] [/C-] [fg bg]

Each of the four command line parameters, /L, /E, /B, and /C, is entirely optional. You may include any number (or none) of them on the command line, entered in either upper- or lowercase. Running STICK with no entries will produce a list denoting the current state of each function. The fg and bg parameters are hexadecimal digits

that represent the desired foreground and background colors used by the /C option, as explained below.

The cursor-locking function is enabled by running STICK with the /L+ parameter (/L- to disable). It causes the current cursor shape to be maintained even inside most applications that choose to alter its appearance. (If you use an EGA, run CTYPE to set the desired cursor shape immediately before turning locking on, even if it already has the form you want. The reason is that STICK relies on the BIOS to hold a value that correctly represents the current cursor definition, and, as I indicated in the last issue, an oversight in the design of EGA BIOS cursor emulation routines prevents this from being true in all cases. CTYPE makes sure that the cursor mode word at offset 60h in the BIOS data area accurately reflects the shape of the cursor.)

The exceptions are the applications that bypass the cursor manipulation routines built into the PC's BIOS by writing values directly to the hardware CRT controller registers. Lotus's 1-2-3, for one, resorts to this ill-behaved tactic. If you come up against one of these programs that work around STICK's software cursor trap, you may have to run the CTYPE utility from Part 1 once you're back on the DOS command line to restore your cursor to the selected shape.

In general, however, cursor locking does its job so well that it even prevents the cursor from changing in instances where you might prefer that it did change. Many text editors and word processors, for ex-

■ STICK.COM contains its own EGA cursor emulation code, which hooks into interrupt 10h and effectively replaces the defective BIOS code.

■ UTILITIES

ample, including the editor built into interpreted BASIC, thicken the cursor as a visual reminder to the user when insert mode is activated. It's easy to forget such features until you're forced to do without them. If you find that with this liability the drawbacks of cursor locking outweigh the benefits, simply negate the feature with /L- before entering the affected application.

A final caveat about cursor locking concerns the use of multiple video modes on EGA- or VGA-equipped systems. If cursor locking is activated when you switch from one mode to another and the two modes feature different numbers of scan lines per character, the cursor may be shifted up or down by several scan lines or, in extreme cases, disappear altogether. You can prevent this from happening by disabling the locking function before switching, for example, from 25-line mode to 43 lines or vice versa.

STICK contains its own cursor emulation code, which is designed to replace the defective BIOS routines and ensure that the cursor isn't destroyed by an action as simple as popping *SideKick* up and back down on a 43-line EGA video display. By default, STICK lets the BIOS handle such calls. But running the utility with /E+ on the command line inserts STICK's own resident code into the loop, where it effectively stands in as a substitute anytime an application calls on the BIOS to set a cursor shape.

Emulation mode is disabled with the command STICK /E-. Cursor calls are thereafter once again transparently directed to the BIOS. If you attempt to turn emulation on and your system is equipped with anything besides an EGA, STICK simply ignores the request. Machines with VGA adapters are allowed to handle cursor calls without interference.

Going hand in hand with the EGA's cursor emulation function is the emulation bit stored in the BIOS data area. The EGA provides its own facility for enabling and disabling cursor fixups by clearing or setting the emulation bit, respectively. Note that setting this bit to 0 turns emulation on. In a reversal of traditional on/off roles, a value of 1 disables the emulation. To maintain compatibility with the EGA BIOS, STICK's emulation code follows

the lead of the emulation bit and doesn't manipulate cursor calls when the bit is toggled on.

STICK's third command line parameter, /B, lets you manipulate the state of the cursor emulation directly. If you use an EGA or VGA, cursor emulation is active by default when your machine is powered on (the emulation bit is zeroed). The emulation bit is rarely changed, but a few applications do set it in order to perform cursor shaping without the risk of BIOS interference. The command STICK /B+ sets the bit value to 1, disabling the EGA routines, and STICK /B- enables them. If you have plugged STICK's cursor emulation code in with /E+, the state of the bit determines whether or not STICK will in-

■ Anytime an application issues a call to the BIOS to clear the screen to DOS's drab default white on black, STICK alters the attribute to match the one you specified.

tercept and manipulate cursor calls intended for a CGA adapter.

The fourth and final command line entry, /C, allows you to substitute your own selection of colors for DOS's default white on black. Anytime an application issues a call to the BIOS to clear all or a portion of the screen to this drab combination, in fact, STICK intercepts the call and alters the attribute to match the one you specified. To enable this feature, run STICK /C followed by a space, a single hex digit (0-F) representing the desired foreground color, another space, and a background color. To activate color locking with intense yellow on a blue background, for instance, type the following command:

STICK /C E 1

The following hex values, like the other

command line parameters, may be entered in either upper- or lowercase.

0 Black	8 Gray
1 Blue	9 Bright Blue
2 Green	A Bright Green
3 Cyan	B Bright Cyan
4 Red	C Bright Red
5 Magenta	D Bright Magenta
6 Brown	E Yellow
7 White	F Bright White

The foreground color may be specified as any value 0 through F. Background color, however, is limited to the first eight selections from the palette, numbered 0 through 7. To disable color locking after it has been invoked, enter STICK /C-. Like the cursor-locking feature, color locking is implemented for all video adapters. The /E switch will work only on EGA systems, while /B is functional for EGA-and VGA-based machines.

UNDERSTANDING STICK The last Utilities column addressed the nature of the bugs in the EGA cursor-handling routines and explained in some detail the consequences of the errors. By way of a brief review, the EGA implements logic in ROM designed to allow software written for CGAs to run on EGAs. The CGA allocates eight scan lines (numbered 0-7) per character, and CGA software often forms an underline cursor by defining it as starting on line 6 and ending on line 7. EGAs, on the other hand, display 14 lines per character when using 25-line text modes on an enhanced color display, and in this situation the emulation logic works. But since the BIOS assumes that it's *always* dealing with a 25-line screen, EGA video modes with higher display densities (e.g., a 43-line display) often have the problem of losing the cursor.

CURSOR LOCKING STICK implements its cursor-locking feature by tapping into interrupt 10h and monitoring the value of AH. If AH is set to 1, the calling application is attempting to alter the cursor's appearance. If locking is enabled, STICK substitutes the scan line designators it recorded when locking was turned on with /L+ for the value sent by the caller in CX. The routine SetCursorMode is called to manipulate the cursor registers, bypassing

10 SECONDS

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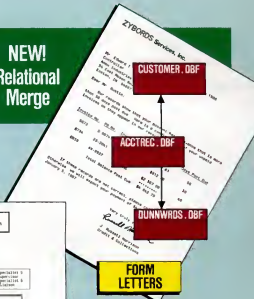
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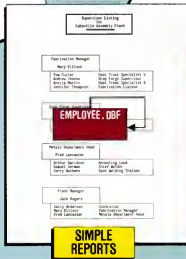
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■ UTILITIES

STICK BY MODEM

The programs published in *PC Magazine* can be downloaded by modem from the PC Magazine Interactive Reader Service. There is no charge for this service, but users are cautioned that these programs are copyright material and are made available only for individual, noncommercial use. You may make copies for others (including placement on noncommercial electronic bulletin boards), as long as no charge is involved. However, making copies for any commercial purpose is strictly prohibited.

The Eastern modem number for PC-IRS is (212) 696-0360. In the West, call (415) 598-9100. Set your modem and communications software to use 2400/1200/300 bps, 8 data bits, 1 stop bit, no parity. Files with a .COM, .EXE, or .ARC extension require use of the Xmodem error-checking protocol; files with .ASM or .BAS extensions can be downloaded using either regular ASCII or Xmodem.

If you use the Xmodem protocol, you can download STICK.COM directly, saving typing or downloading either the .BAS or the .ASM version. STICK.BAS, whether entered from the magazine at your keyboard or downloaded from PC-IRS, will automatically create STICK.COM when run once in BASIC. STICK.ASM, also listed both here and on PC-IRS, allows you to modify the program but requires you to use a macro assembler (IBM or Microsoft, Version 2 or later) and the following commands:

```
MASH STICK;
LINK STICK;
EXEC2BIN STICK STICK.COM
```

Photocopy this page. Trim and hole-punch the copy and add it to your DOS manual.



Jeff Prosize

Purpose:

Locks/unlocks a cursor size and shape set with CTYPER.COM (Volume 6 Number 19); similarly locks/unlocks a choice of EGA foreground and background colors, and permits selective replacement of the EGA BIOS code for CGA emulation.

Format:

```
[d:] [path] STICK [/L+|-] [/E+|-] [/B+|-] [/C-] [fg bg]
```

Remarks:

STICK is a memory-resident (560 bytes) program that eliminates several recurring problems connected with the Enhanced Graphics Adapter (EGA) and display. A nonresident utility such as CTYPER.COM can set a cursor size and shape in DOS, and it can prevent the cursor loss frequently encountered when exiting from utilities such as *SideKick* while using a 43-line EGA display. CTYPER alone can do nothing when applications reset the cursor, however, as they normally do. The STICK /L+ option locks in the cursor shape for all but applications (such as 1-2-3) that bypass the PC BIOS cursor routines altogether. To permit some applications (such as word processors) to manipulate the cursor shape themselves, the STICK /L- option disables cursor locking.

The STICK /C fg bg option sets EGA foreground and background colors, respectively, using the hex digits shown below:

0 Black	8 Gray
1 Blue	9 Bright Blue
2 Green	A Bright Green
3 Cyan	B Bright Cyan
4 Red	C Bright Red
5 Magenta	D Bright Magenta
6 Brown	E Yellow
7 White	F Bright White

The foreground color (fg) may range from 0 through F; background (bg) values are limited to 0 through 7. A single space must separate each parameter. The /C- option disables the color-selection locking.

The STICK /E+ option substitutes STICK's own cursor emulation BIOS code for the bug-ridden IBM emulation routines. By default, or by using the /E- option, the IBM code is restored. Since the EGA provides an emulation bit whose setting is stored in the BIOS data area, STICK provides an option to set or reset this bit directly. If the /E+ option is active (emulation on), STICK /B+ sets the bit value to 1 (disabling the EGA routines); STICK /B- reenables them.

Entered with no parameters, STICK reports the current settings of its functions. Any or all optional parameters can be entered on a single command line in either upper- or lowercase. The /L and /C options are implemented on all video adapters; the /E switch is limited to EGA systems; /B is functional on EGA- and VGA-based machines.

STICK
Command

1987/No. 20 (Utilities)

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Framework	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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```

cmp cl,edgeter],1          ;EGA installed?
jns paaa                  ;no, then pass control to $100
push ax                   ;save registers
mov ax,lines_data         ;make sure EGA is active
mov ax,ax
assume ax:line_data
test ax,[ax],info],8      ;exit if it's not
                            ;emulation bit set?
jns axit                  ;yes, then exit
push bx                   ;save remaining registers
push cx
push dx
}
; determines whether or not this call was intended for a CGA.
{
cmp cl,7                  ;CGA-type cursor?
jns setmode               ;no, then don't alter values
nr cl,cl                  ;EGA ending line?
jns setmode               ;yes, then don't touch it
}
; scale the starting and ending scan lines.
{
mov bx,cx
mov ax,linesh
int 10h
mov ax,cl
dec al
sub al,bh
nr bh,bh
jns endline
add bh,al
endline:
add bh,al
cmp bx,AC00h
jns skip
mov bx,AB00h            ;yes, then raise it a line
adjust ending line for EGA
skip:
inc bl
mov bl,cl
jns nowrap
mov bl,bh
or bx,bx
jns fullheight
mov bl,linesh
mov cx,bx
fullheight:
;adjust for full height
;transfer value back to CX
}
; set the cursor and exit.
{
setmode:
call SetCursorMode       ;set the cursor
                           ;structure registers and exit
pop dx
pop cx
pop bx
pop ax
iret
}
;Exit to the $100 interrupt handling code.
{
exit:
pop ax                   ;exit to $100
jnp cwid_video
VideoInt
endp
}
;-----
;SetCursorMode sets the cursor to the scan lines indicated in CX.
;-----
SetCursorMode c near
mov ax,lines_data         ;address $100 data area with ES
assume ax:line_data
mov ax:[line_cursor],cx
mov dx,ax:[addr $A45]     ;store cursor mode
get CRTC_address         ;get CRTC address
port cx and cl to cursor registers
}
;-----
SetCursorMode endp
leabyte equ $
}
;-----
;this routine receives control when the program is run.
;-----
line0 db 12,10,"Cursor Locking:  $"
line1 db "Color Locking:  $"
line2 db "Emulation mode:  $"
line3 db "EGA Emulation $10:  $"

```

```

;usage      db "13.18,\"Usage: [d|l|p|h]BYECK [/s-] [/B-] \"
;           db "/S-] [/C-] [s b]\",13.18,\"\"
on         db "00\",13.18,\"\"
off        db "00ff\",13.18,\"\"
bitvalue   db "B\",13.18,\"\"

;etc
proc near
assume cs=codes,data=ds,es=ds,eax=eax
;
; determine what type of video adapter is installed.
;
mov ax,1A90h                                ;look for a VGA
int 10h
cmp al,1Ah
jnc check_age                               ;branch if not found
cmp hl,7
jc search                                   ;make sure it's a VGA
cmp hl,8
jc search                                   ;make sure it's a VGA

check_age:
jc search                                   ;check for an EGA
mov ah,12h
mov hl,10h
int 10h
cmp hl,12h
jnc search                                   ;branch if EGA is found
set ADAPTER for CGA or MDA

;see if the resident portion of the program is already installed.
;
assume something
old                                             ;wiring moves forward
mov word ptr [si-1],0                         ;insert first two bytes of signature
mov bx,0x0000                                ;initialize search segment
mov ax,cs                                     ;record current segment
inc bx                                        ;increment search index
mov ax,bx
cmp ax,bx
jc andloop                                   ;yes, then it's not installed
mov si,offset begin                           ;look for program signature
mov di,0
cpe repeb
jnc nottag                                   ;loop if search failed
;
;check the command line for entries.
;
andloop:
mov si,17h                                  ;point 0001 to command line
cmp byte ptr [si-1],2
jb noparams                                  ;any parameters entered?
;no, then branch
call ShowParam
jnc noparams                                  ;branch if one is found
;
;No parameters were entered. Display current switch settings.
;
noparams:
mov ah,9                                     ;display cursor lock state
mov dx,offset line1
int 21h
mov di,offset locking
call ShowState
;
mov ah,9                                     ;display color lock state
mov dx,offset line2
int 21h
mov di,offset foreground
call ShowState
;
mov ah,9                                     ;EGA installed?
cmp adapter,1
jnc terminate
;no, then exit now
;
mov ah,9                                     ;display cursor emulation state
mov dx,offset line3
int 21h
mov di,offset emulation
call ShowState
;
mov ah,9                                     ;display emulation bit setting
mov dx,offset line4
int 21h
mov ax,bios_data                             ;address BIOS data area with 25
mov es,ax
test es:[esw_info],1                         ;emulation bit set?
jbc bitclear                                  ;no, then branch
inc bitvalue                                  ;modify text string
mov ah,9
mov dx,offset bitvalue
int 21h
;
total/ret:
mov ax,4C00h
int 21h
;exit with ERRORLEVEL = 0
;
;Parse the remainder of the command line for parameters.
;
getparms:
cmp al,0
jnc badparm                                  ;no, then signal error

```

(STICK ASM continues)

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■ UTILITIES

```

lodsb                ;get current character
and al,800h          ;capitalise it
;spitalise it
;lock parameter?

get1:                ;color parameter?
;Color parameter?

get2:                ;Emulation parameter?
;Emulation parameter?

get3:                ;Bit parameter?
;no, then it's invalid

continues:           ;look for another entry
call FindParam       ;loop back if one is found
;

;Exit and install resident code if it isn't already installed.
;
mov ax,cx             ;already installed?
mov bx,ax
cmp ax,bx
je install           ;no, then install it
;
;Exit with ERRORLEVEL = 8
mov ax,4c00h
int 21h

install:             ;save and replace int 1ah vector
mov ax,2510h
int 21h
mov old10h,bx
mov old10h[2],ax

mov ax,2510h
mov dx,offset Videoint
int 21h

mov ah,9
mov dx,offset copyright
int 21h

mov ax,word ptr dx[2ch]
mov ax,ax
mov ah,4bh
int 21h

mov ax,1100h          ;terminate-but-stay-resident
mov dx,offset lastbyte - offset code + 15; ah 4
int 21h

;An invalid entry was encountered. Display error message and exit.
badparm:             ;print error message
mov ah,9
mov dx,offset armap
int 21h
mov ax,4c00h
int 21h

;Exit with ERRORLEVEL = 1

;=====
;Bdlock interprets the command line parameter /L.
;
Bdlock:              ;get next character
lodsb                ;plus symbol?
cmp al,"+"
jne lock1
;turn cursor locking on
mov byte ptr ax:[locking],0
mov ah,3
int 10h
mov ax:[cursor_mode],cx
;store it
jmp short continues
cmp al,"-"
jne lock1
;minus symbol?
jne badparm
;no, then it's invalid
mov byte ptr ax:[locking],0FFh
;turn cursor locking off
jmp short continues

;=====
;Bdml interprets the command line parameter /C.
;
Bdml:                ;get next character
lodsb                ;plus symbol?
cmp al,"+"
jne smul
;turn emulation on
mov byte ptr ax:[emulation],0
jmp short continues
cmp al,"-"
jne badparm
;no, then it's invalid
mov byte ptr ax:[emulation],0FFh
;turn emulation off
jmp short continues

;=====
;Bdcolor interprets the command line parameter /C.
;
Bdcolor:             ;get next character
lodsb                ;minus symbol?
cmp al,"-"
jne color1
;no, then read hex digits
mov ax:[foreground],0FFh
;yes, then toggle color off
jmp continues
call Convert
;get foreground color
;branch on error

mov ah,1
int 1h
call Colorout
;save it in AX
;skip space
;get background color
;branch on error
;attributes in range?
;no, then signal error
;store color values

;=====
;Bdbit interprets the command line parameter /B.
;
Bdbit:               ;get adapter,1
;bit1
;bit2
;no BGA or VGA installed?
;no, then ignore the entry
;get next character
;plus symbol?
;save ax
;point to 800 data area
;clear bit 1 of BGA info byte
;restore ax
;point to 800 data area
;clear bit 8 of BGA info byte
;point to 800 data area
;=====
;FindParam scans the command line for the first non-space character.
;Entry: dx:dx = command line ; Exit: CF clear = text found
; ; CF set = none found
;
FindParam:           proc near
lodsb                ;get next character
cmp al,13
je empty
;yes, then search
cmp al,32
je FindParam
clic
clear CF
empty:               ret
;exit CF
FindParam:           endp

;=====
;Convert reads a hex digit and converts it to binary.
;Entry: dx:dx = character ; Exit: AL = value
; ; CF clear = no error
; ; CF set = error
;
Convert:             proc near
lodsb                ;skip a character
cmp al,"A"
je convert1
;less than "A"?
cmp al,"F"
je alpha
;greater than "F"?
sub al,30h
clic
clear CF
;and exit
;capitalise character
cmp al,"a"
je convert2
;less than "a"?
cmp al,"f"
je convert3
;greater than "f"?
sub al,37h
clic
;convert to binary
ret
convert1:            atc
;not CF
convert2:            atc
convert3:            atc
Convert:             endp

;=====
;ShowData displays the state of the indicated byte (0FFh = "off")
;Entry: dx:dx = byte value
;
ShowData:           proc near
mov ah,9
mov dx,offset off
;prepare for output
;assume it's off
cmp byte ptr ax:[di],0FFh
;is it really off?
je show1
;yes, then proceed
;no, then reset string address
mov dx,offset no
int 21h
;print "on" or "off"
ShowData:           endp
code
end
end begin

```

(STICK.ASM ends)

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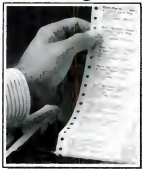
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■ UTILITIES

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100 REM = BASIC PROGRAM TO CREATE STICK.COM
110 OPEN "STICK.COM" AS #1 LEN = 1
120 FIELD #1,16 AS C
130 CHECKSUM = 0
140 FOR I = 1 TO 130
150 LINESUM = 0
160 FOR J = 1 TO 8
170 READ BYTE
180 CHECKSUM = CHECKSUM + BYTE
190 LINESUM = LINESUM + BYTE
200 IF (BYTE < 254) THEN LET AS = CHR$(BYTE)
210 PUT #1
220 NEXT J
230 NEXT I
240 READ LINECHECK
250 IF LINECHECK <> LINESUM THEN PRINT "Error in Line":200 + 10 + J
260 NEXT J
265 CLOSE
270 IF CHECKSUM = 09996 THEN PRINT "Successful Completion": END
280 PRINT "CON file is not valid": END
285 DATA 233, 218, 1, 8, 84, 73, 47, 75, 824
286 DATA 35, 45, 46, 48, 32, 48, 90, 43, 387
310 DATA 32, 49, 57, 56, 55, 32, 50, 195, 474
318 DATA 182, 182, 32, 67, 111, 189, 189, 117, 749
320 DATA 118, 189, 98, 97, 116, 185, 111, 116, 853
348 DATA 115, 32, 67, 111, 46, 128, 18, 36, 438
350 DATA 26, 74, 181, 182, 182, 32, 88, 114, 631
360 DATA 111, 315, 185, 115, 181, 255, 255, 255, 1312
370 DATA 0, 8, 8, 2, 8, 8, 8, 2
380 DATA 251, 128, 252, 6, 114, 43, 128, 252, 1174
390 DATA 7, 119, 33, 18, 182, 117, 38, 46, 950
400 DATA 246, 6, 63, 1, 128, 117, 31, 128, 718
410 DATA 255, 7, 117, 16, 46, 138, 62, 64, 705
420 DATA 1, 81, 177, 4, 218, 231, 89, 46, 839
430 DATA 18, 62, 63, 1, 46, 255, 46, 46, 551
440 DATA 1, 128, 252, 1, 117, 246, 246, 197, 1508
450 DATA 32, 117, 241, 46, 128, 62, 63, 1, 680
460 DATA 255, 116, 17, 88, 81, 82, 6, 46, 883
470 DATA 139, 14, 45, 1, 232, 118, 8, 1, 578
480 DATA 98, 89, 287, 4, 128, 62, 62, 772
490 DATA 1, 255, 116, 208, 46, 128, 62, 67, 883
500 DATA 1, 1, 117, 208, 88, 6, 144, 64, 653
510 DATA 8, 342, 192, 38, 246, 6, 135, 8, 759
520 DATA 8, 317, 75, 38, 246, 6, 135, 8, 625
530 DATA 6, 117, 67, 81, 82, 128, 246, 888
540 DATA 7, 319, 58, 18, 281, 116, 46, 139, 488
550 DATA 217, 184, 48, 17, 285, 16, 138, 193, 1818
560 DATA 254, 289, 42, 195, 18, 255, 116, 2, 1874
570 DATA 5, 248, 2, 216, 129, 251, 13, 12, 873
580 DATA 117, 3, 187, 12, 11, 254, 195, 58, 837
590 DATA 217, 117, 2, 58, 219, 13, 219, 117, 952
600 DATA 2, 179, 38, 138, 282, 232, 13, 8, 788
610 DATA 98, 89, 91, 7, 88, 287, 7, 88, 467
620 DATA 46, 255, 46, 68, 3, 184, 64, 6, 464
630 DATA 142, 182, 38, 137, 14, 96, 8, 38, 457
640 DATA 139, 32, 99, 8, 178, 18, 238, 64, 758
650 DATA 138, 197, 238, 74, 176, 11, 238, 64, 1138
660 DATA 138, 193, 238, 185, 17, 18, 67, 117, 971
670 DATA 115, 111, 114, 32, 76, 311, 99, 772
680 DATA 187, 185, 118, 183, 58, 32, 32, 579
690 DATA 32, 32, 32, 32, 67, 111, 188, 111, 529
700 DATA 114, 32, 76, 111, 98, 187, 185, 118, 754
710 DATA 187, 185, 32, 32, 32, 32, 32, 32, 353
720 DATA 32, 32, 32, 32, 67, 111, 188, 111, 529
730 DATA 185, 311, 118, 32, 77, 111, 188, 101, 747
740 DATA 58, 32, 32, 32, 32, 32, 32, 32, 286
750 DATA 69, 71, 45, 32, 68, 189, 117, 188, 448
760 DATA 87, 185, 111, 118, 32, 66, 189, 142
770 DATA 116, 58, 32, 32, 32, 32, 32, 32, 329
780 DATA 85, 115, 97, 183, 181, 58, 32, 91, 682

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789 DATA 188, 58, 93, 91, 112, 97, 116, 184, 371
800 DATA 83, 83, 84, 73, 67, 75, 32, 91, 598
810 DATA 47, 76, 43, 124, 45, 93, 32, 91, 551
820 DATA 47, 64, 43, 124, 45, 93, 32, 91, 544
830 DATA 47, 64, 43, 124, 45, 93, 32, 91, 541
840 DATA 47, 67, 45, 124, 32, 182, 183, 32, 552
850 DATA 98, 183, 93, 13, 18, 36, 79, 118, 542
860 DATA 13, 18, 36, 79, 182, 182, 13, 18, 365
870 DATA 36, 48, 13, 18, 36, 184, 8, 26, 353
880 DATA 285, 16, 68, 26, 117, 18, 128, 251, 813
890 DATA 7, 116, 24, 128, 251, 8, 116, 19, 469
900 DATA 254, 14, 67, 1, 188, 18, 179, 16, 720
910 DATA 285, 16, 128, 251, 16, 117, 6, 284, 951
920 DATA 14, 67, 1, 252, 195, 6, 8, 1, 548
930 DATA 8, 8, 51, 219, 148, 288, 67, 142, 819
940 DATA 195, 59, 195, 116, 12, 198, 8, 1, 788
950 DATA 139, 254, 195, 16, 8, 243, 166, 117, 1128
960 DATA 237, 189, 6, 184, 184, 255, 2, 1465
970 DATA 114, 5, 232, 92, 1, 115, 82, 188, 821
980 DATA 8, 186, 44, 2, 285, 33, 191, 61, 733
990 DATA 1, 232, 119, 1, 188, 8, 186, 68, 796
1000 DATA 2, 285, 33, 191, 63, 3, 232, 186, 833
1010 DATA 1, 128, 62, 67, 1, 1, 117, 44, 422
1020 DATA 188, 9, 186, 98, 2, 285, 33, 191, 694
1030 DATA 62, 1, 232, 86, 1, 188, 9, 186, 757
1040 DATA 112, 3, 285, 33, 184, 44, 8, 142, 747
1050 DATA 192, 8, 246, 6, 135, 1, 116, 734
1060 DATA 4, 254, 8, 285, 2, 188, 9, 186, 858
1070 DATA 289, 2, 285, 33, 184, 8, 76, 285, 514
1080 DATA 32, 68, 47, 117, 94, 172, 36, 223, 782
1090 DATA 67, 117, 3, 232, 149, 8, 48, 68, 698
1100 DATA 117, 3, 232, 117, 144, 68, 66, 117, 858
1110 DATA 64, 233, 178, 8, 232, 226, 8, 115, 1958
1120 DATA 216, 148, 288, 148, 195, 59, 195, 116, 1261
1130 DATA 5, 184, 8, 76, 285, 33, 184, 16, 783
1140 DATA 53, 127, 38, 48, 1, 148, 667
1150 DATA 6, 78, 1, 184, 16, 37, 186, 72, 572
1160 DATA 1, 285, 33, 188, 9, 186, 3, 1, 618
1170 DATA 285, 33, 181, 64, 8, 142, 192, 188, 957
1180 DATA 73, 285, 33, 184, 18, 35, 785, 785
1190 DATA 8, 285, 33, 188, 9, 188, 132, 2, 749
1200 DATA 285, 33, 184, 1, 76, 285, 33, 172, 988
1210 DATA 68, 63, 117, 37, 38, 188, 6, 63, 548
1220 DATA 1, 8, 188, 3, 285, 16, 38, 137, 588
1230 DATA 24, 45, 1, 235, 159, 48, 45, 117, 588
1240 DATA 6, 188, 6, 63, 1, 255, 235, 1812
1250 DATA 147, 172, 68, 43, 117, 8, 38, 198, 783
1260 DATA 6, 62, 1, 8, 235, 134, 48, 45, 543
1270 DATA 117, 131, 38, 188, 6, 42, 1, 255, 878
1280 DATA 238, 121, 295, 18, 48, 45, 117, 9, 1812
1290 DATA 38, 188, 6, 63, 1, 255, 233, 187, 981
1300 DATA 255, 232, 98, 8, 114, 145, 138, 224, 1218
1310 DATA 70, 232, 82, 8, 114, 397, 68, 7, 722
1320 DATA 193, 153, 38, 136, 38, 43, 38, 588
1330 DATA 142, 64, 1, 232, 78, 255, 128, 62, 983
1340 DATA 337, 16, 6, 184, 64, 8, 142, 192, 721
1350 DATA 38, 128, 14, 135, 8, 1, 7, 233, 556
1360 DATA 58, 295, 68, 45, 117, 16, 6, 184, 733
1370 DATA 64, 8, 142, 192, 38, 128, 38, 135, 737
1380 DATA 8, 254, 7, 233, 38, 255, 233, 98, 1182
1390 DATA 255, 172, 48, 13, 116, 6, 8, 32, 714
1400 DATA 116, 247, 249, 195, 249, 195, 172, 68, 1482
1410 DATA 48, 114, 22, 48, 37, 119, 1, 44, 488
1420 DATA 48, 248, 195, 36, 223, 68, 55, 114, 988
1430 DATA 8, 68, 78, 119, 4, 44, 55, 288, 688
1440 DATA 195, 248, 195, 188, 9, 186, 285, 2, 1219
1450 DATA 38, 138, 61, 285, 116, 3, 184, 184, 885
1460 DATA 2, 285, 33, 195, 8, 8, 8, 435

```

STICK.BAS: A BASIC program that will automatically generate STICK.COM

TSR up and down in 35- or 43-line mode won't destroy the cursor.

STICK takes care to increment the ending scan line by 1 to satisfy EGA cursor register protocol (see Utilities, Volume 6 Number 19, for an explanation). If this last operation produces a 0 in both CH and CL, CX is changed to 001Eh, representing the

EGA's version of a block cursor. And if the end result is a value in CX of 0C0Dh, the specifier for a true underline cursor in 25-line text modes, CH and CL are decremented to move the cursor up a single scan line. The normal EGA underline cursor resides on scan lines 11 and 12 rather than 12 and 13.

COLOR LOCKING (including DOS) that want to clear either all or a portion of the screen call interrupt 10h with AH set to 6 or 7. Functions 6 and 7 provide services to automatically scroll a window up or down (if AL is 0 on entry) to blank the contents of the region using an attribute specified in

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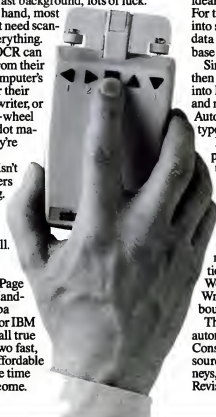
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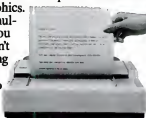
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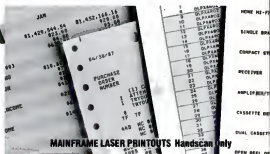
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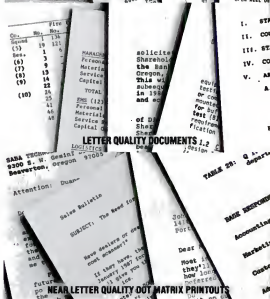
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■ UTILITIES

BH. Since STICK has already directed interrupt 10h to its own monitoring routines for the sake of its smart cursor features, it's a simple matter to watch for calls to these functions as well.

If STICK intercepts an interrupt 10h and finds AH set to either 6 or 7, it looks for a value of 0 in AL to see whether the region defined by CX and DX is to be cleared. If AL is indeed zeroed, STICK examines BH for the plain-vanilla attribute 7. A screen clear to any other color combination is passed unscathed to the BIOS; an attribute of 7 is changed to reflect the foreground and background attributes defined on the command line after the /C parameter. The call is then transferred on to the BIOS, where the screen is initialized to the newly defined colors.

Color locking works very well for DOS but is no more than moderately effective with applications. Many such programs follow up a screen clear by using BIOS

functions to write character/attribute pairs. We could introduce a higher degree of locking integrity by intercepting function 9 and preventing white-on-black characters from being written, but far too many applications (especially the popular ones) go directly to video memory in order to achieve faster display updates. The better solution is to leave function 9 alone and be satisfied with a scheme that improves the looks of DOS. (Robert L. Hummel provided a more comprehensive and extremely elegant solution to color selection for EGA users with SPECTRUM, in PC Lab Notes, Volume 6 Number 12.)

INSTALLATION STICK installs the resident portion of itself only once, the first time it's run with one or more command line entries. The bulk of its code is devoted to parsing the command line and interpreting what it finds there. The most critical aspect of this process is determining at run

time whether the resident code, complete with the data bytes that reflect the state of each feature, is already present in memory and, if it is, communicating with it.

STICK begins by determining whether or not the system is equipped with an EGA. A byte value indicating what type of adapter is present is stored away in an address relative to the code segment. If STICK is being run for the first time, the ADAPTER byte will become resident along with the new interrupt 10h code; if the resident portion is already installed, ADAPTER will be discarded along with the rest of the utility upon termination.

STICK then turns to the task of searching memory for a previously loaded copy of itself. Using ES as an index segment register, it begins at the bottom of memory and examines every segment below the current code segment for the text of its own copyright message. The first word is zeroed before the search is started, so the

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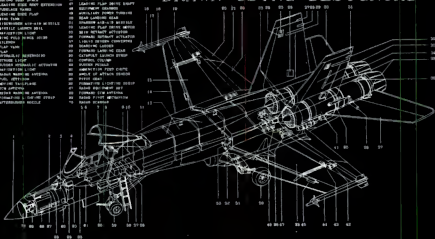
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■ UTILITIES

contents of DOS buffers in low memory won't yield a false match. If another copy is found, ES will address it upon exit from the loop. If it's not found, then ES ends up holding the value of the current code segment, just as it did when DOS first handed control to the new process.

Throughout the remainder of the program, the contents ES are preserved and any reference to named memory locations tucked away inside the resident area is prefixed with the ES register. If STICK has been loaded once before, the variables attached to the resident interrupt code are updated; if it hasn't, those in the current segment, which will later become resident, are updated.

When parsing is completed, STICK terminates either with interrupt 21h, function 31h, to install the resident portion of itself, or through function 4Ch to terminate normally. A call to function 31h is preceded by the revectoring of interrupt 10h to address the new video interrupt handler.

STICK should serve as a worthy companion to CTYPE to help you customize your cursor and make sure that it neither changes nor goes away. And with color locking thrown in as an added bonus, there's a wealth of power packed into a small package. The structure of the utility is such that you could even append your own command-line parameters to do all sorts of things with interrupt 10h. If for no other reason, use STICK to replace the faulty cursor emulation code on-board the EGA. The peace of mind you gain from knowing your cursor is safe from harm is well worth the few extra bytes of RAM.

STICK won't serve as an instant cure for all of your cursor and color woes, due in part to the large number of programs that deal directly with the video hardware and work around the BIOS. Without hardware help, a utility is helpless to prevent this from happening. And even the things STICK does well won't prove to be desirable in every instance. But by experimenting with STICK's various capabilities when used with your favorite applications programs, you'll be able to achieve great strides toward a more stable and satisfying video environment.

Jeff Prossie is a contributing editor of PC Magazine.

PC MAGAZINE

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OS/2 PROGRAM ENTRY CONDITIONS

This installment takes a detailed look at the OS/2 code, data, and environment segments and presents a program that displays the environment segment in hex and character formats.



When a program begins execution, it's almost as if it were a person waking from a deep sleep. The program first takes a look around at its environment and gets its bearings, then perhaps makes a couple of telephone calls to the operating system, and only then gets out of bed to do some work.

During initialization, the program might need to know the hardware configuration of its host machine, and it might need to access the command line the user entered. Some of this information is obtained through calls to the operating system. Other information is provided directly to the program through the initial values of the CPU registers.

As we saw in this column in the last issue, a program running under OS/2 requires very little overhead to get moving. By contrast, a program running under MS-DOS can't even access its own data segments without first setting the DS or ES segment registers. It's time now to explore the entry conditions of an OS/2 program in more detail.

PROGRAM CODE SEGMENTS A program running under OS/2 has one or more segments that contain executable code. Each of these segments can be up to 64K in length. The number of code segments in a program is indicated by the program's memory model: a small or compact model program has one code segment; a medium-sized or large model program has multiple code segments.

The assembly language programmer can use the `.CODE` directive to define a

code segment. As with MS-DOS, the entry point of the program is specified in the `END` statement. This entry point can be anywhere within any of the program's code segments. When an OS/2 program begins execution, the CS (code segment) and IP (instruction pointer) registers point to this entry point, as shown in the "Program Code Segment" diagram. If an OS/2 program contains multiple code segments, the program can reach them through far calls or jumps, just as under MS-DOS.

THE AUTOMATIC DATA SEGMENT

An OS/2 program also has one or more data segments, each of which can also be up to 64K in length. Small or medium-sized model programs have only one data segment; compact or large model programs have multiple data segments. The default data segment in the program, which is also called the "automatic data

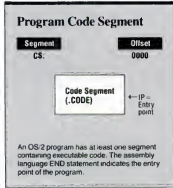
segment," contains the program's stack.

When you use the new simplified segment directives to write an assembly language program, the automatic data segment is actually a group, called the `DGROUP`, that comprises four different segments. Within an assembly language program you treat the data following the `.DATA`, `.DATA?`, `.CONST`, and `.STACK` directives as separate segments, but these are grouped into one physical segment during linking.

On entry to the program, the DS (data segment) and SS (stack segment) registers both reference the program's automatic data segment. The SP register is set at the top of the stack area, and the CX register indicates the total size of the segment. The organization of the automatic data segment is shown in the accompanying diagram "The Automatic Data Segment."

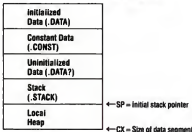
If your OS/2 assembly language program requires more than one data segment, you can define additional data segments using the directives `.FARDATA` (for initialized data) and `.FARDATA?` (for uninitialized data). These segments have names that are either derived from the name of the `.ASM` source code file or specified explicitly as an argument to the directive.

You'll notice in "The Automatic Data Segment" that the top of the segment contains the program's local heap. The heap is an area of memory that the program can use for dynamic memory allocation. When an assembly language program does not have a local heap, as is generally the case, CX will be set equal to SP.



■ ENVIRONMENTS

The Automatic Data Segment

Segment
DS, SS:Offset
0000

On entry to an OS/2 program the DS and SS registers reference the program's automatic data segment. This segment contains the program's stack.

SEGMENT LIMIT PARANOIA On entry to an OS/2 program, the CX register is the size of the automatic data segment. If you think of CX as a pointer, it points to one byte beyond the end of the segment.

Under protected mode, bytes beyond the end of a segment do not exist. Each segment has a specific limit, and you cannot access any data beyond that limit. When working in protected mode, programmers sometimes call the fear of accessing data beyond the end of a segment "segment limit paranoia."

When you use a register or an explicit address to access the program's automatic data segment, the address must thus be less than that initial value of CX. Here's an example of the kind of thing you *cannot* do at the beginning of your program.

```
Mov BX, CX
Mov AL, [BX]
```

This code causes the 80286 to generate an internal interrupt 13, which means "General Protection Fault." OS/2 traps that interrupt, aborts execution of the program, displays a message about the protection fault, and returns control to the command processor.

When programming for OS/2, you'll come to love those protection fault messages. Although they indicate a bug in your program, it's very often a bug that would have crashed the system under the

real-mode environment of MS-DOS. Under protected mode you'll find that very little rebooting is required when you're debugging a new assembly language program.

OS/2 ENVIRONMENT SEGMENT

We've seen that an OS/2 program has direct access to at least two segments: a code segment and a data segment. The program also gets access to a third segment, which contains a copy of the system environment (identical in structure to the MS-DOS environment) and the program's command line. This is shown in the diagram "The Environment Segment."

As with MS-DOS, the environment contains a set of strings that indicate such things as the COMSPEC (command processor) and the PATH. Each of the environment strings is terminated by an ASCII zero byte; the last is terminated by two zeros. As with DOS 3.x (but not 2.x), this is followed by the fully qualified pathname of the program being executed and another ASCII zero.

In this third segment, the environment is followed by the command line of the program. The BX register points to the name of the program (exactly as it was typed on the OS/2 command line) followed by a zero byte, and then to the parameters to the program, followed by two ASCII zeros.

An OS/2 program does not need to save the AX and BX registers if it intends to access the environment segment later. The values can be obtained through the DOS-GETENV function call instead. And for digging into the environment, OS/2 has a function called DOSSCANENV that takes the name of an environment variable (such as "PATH") and returns a pointer to the string following the equals sign.

THE ENVIRON PROGRAM Figure 1 lists a program called ENVIRON.ASM that displays the contents of the program's environment segment in a hexadecimal and character format. Notice the use of the LSL ("load segment limit") instruction near the top of the program. LSL is an 80286 protected-mode instruction that obtains the limit of a segment. You'll find this a very handy instruction for alleviating segment limit paranoia.

Figure 2 shows the output from this program when I ran it on my system by entering

```
environ ABC def
```

on the OS/2 command line. The fully qualified name of the program begins at offset 000E0h. The dash in the hexadecimal listing indicates the value of register BX.

Each screen group currently active during an OS/2 session can have a different system environment. You'll notice that the COMSPEC environment variable indi-

The Environment Segment

Segment
AX:Offset
0000

A third segment created for an OS/2 program contains a copy of the system environment and the program's command line.

■ ENVIRONMENTS

```

0000 33 58 42 47 58 3D 63 3A 5C 6F 73 32 5C 63 6F 6D 3XBOK=c:\os2\com
0010 6D 61 6E 64 2E 63 6F 6D 88 43 4F 4D 53 59 45 43 mand.com.COMSPEC
0020 3D 43 3A 5C 47 53 32 5C 43 4D 44 2E 45 58 45 88 ~c:\os2\cmd.exe.
0030 58 52 47 4D 58 54 3D 24 65 5B 33 33 3B 34 34 3B PROMPT=&[33;44;
0040 31 6D 24 78 5D 88 58 41 54 48 43 43 3A 5C 47 53 1m$P).PATH=c:\os
0050 32 43 4D 44 38 43 3A 5C 47 53 32 55 54 49 48 3B 2CMD;C:\OS2UTIL;
0060 43 3A 5C 47 53 32 4C 41 4E 47 3B 43 3A 5C 47 53 C:\OS2LANG;C:\OS
0070 32 4D 53 43 5C 42 49 4E 58 3B 43 3A 5C 47 53 32 2HSE\BINP;C:\OS2
0080 41 53 4D 3B 43 3A 5C 47 53 32 3B 43 3A 5C 47 53 ASH;C:\OS2;C:\TO
0090 47 4C 53 88 49 48 43 4C 55 44 45 4D 63 3A 5C 6F OLS.INCLUDE=c:\o
00A0 73 32 6D 73 63 5C 69 6E 63 6C 75 64 65 3B 63 3A s2mac\include;c:
00B0 5C 6F 73 32 61 73 6D 5C 69 6E 63 6C 75 64 65 88 \os2asm\include.
00C0 4C 49 42 3D 63 3A 5C 6F 73 32 6D 73 63 5C 6C 69 LIB=c:\os2mac\li
00D0 62 88 49 4E 49 54 3D 63 3A 5C 69 6E 69 74 88 8B b.\TWI=c:\init..
00E0 43 3A 5C 54 45 58 54 5C 45 4E 56 5C 4E 56 49 C:\TEXT\ENV\ENV
00F0 52 47 4E 2E 45 58 45 88-65 6E 76 69 72 6F 6E 88 ROM.EXE.envirom.
0100 28 41 42 43 28 64 65 66 88 88 ABC def..

```

Figure 2: Sample output of the ENVIRON program showing the environment and the program's command line.

As we've seen, however, the most important components of the PSP—the command line and the environment—have been combined into one segment under OS/2. Everything else that is still relevant under OS/2 is handled elsewhere.

HOW MANY SEGMENTS? I've been saying that an OS/2 program can contain one or more code segments and one or more data segments without stating what the maximum is. In theory, a program running under OS/2 can be quite large and contain many different segments. Programs can also allocate additional blocks of memory during run-time using function calls such as DOSALLOCSEG.

Although the 80286 can directly address 16 megabytes of memory, it's often stated that the chip has a 1-gigabyte virtual address space. Anything beyond the memory actually connected to the 80286 is stored on a mass storage device, such as a hard disk, and swapped into memory when needed.

This 1-gigabyte virtual address space is divided into two pieces. All code and data segments are referenced through descriptor tables. The Global Descriptor Table (GDT) can contain references to 8,095 segments. If each segment were 64K in length, that would be a total of almost 512 megabytes. Each Local Descriptor Table (LDT) can also contain references to another 8,095 segments, for another 512 megabytes.

OS/2 uses 80286 protected mode in a conventional manner. The operating system maintains one GDT for system use.

The segments defined in the GDT are generally off-limits to programs.

Each program running under OS/2 has its own LDT. This means that (in theory) each program can access 512 megabytes of memory. However, under OS/2 it appears that half of the segments definable in the LDT are reserved for dynamic link libraries and another half of those remaining cannot be used, which leaves a program access to about 2,048 segments.

Is this for real? Well, I've managed to allocate about 1,900 segments from an OS/2 program using the DOSALLOCSEG function. To test this, I made each of the segments one byte in length. In theory they could have been 64K, for a total of almost 128 megabytes.

However, you can't come close to allocating 128 megabytes from an OS/2 program because the hard disk used for swapping is limited to 32 megabytes (under the initial version of OS/2), and you probably have files stored on it already.

The LINK program included with the OS/2 Software Development Kit has a stated maximum of 1,024 segments, which would be enough to create a program that is 64 megabytes in size. Again, however, this would be impossible in practice because the program would be twice as large as the maximum hard disk size.

Even so, the extra memory under OS/2 does make past attempts to squeeze an extra 64K out of the DOS address space seem a little silly. Even the 8 megabytes provided by the Lotus/Intel/Microsoft expanded memory specification looks small by comparison.

THE INFORMATION SEGMENTS

One segment in the GDT and one segment in each program's LDT provide some interesting information that programs can access. Pointers to these two segments are obtained through the OS/2 function DOSGETINFOSEG.

The information segment in the GDT contains the current time, date, OS/2 version number, some scheduling parameters, the boot drive, information about the maximum number of screen groups, the current screen group, the current foreground process, and some trace information for use by debuggers.

The LDT information segment provides information about the particular program associated with that LDT, such as its process ID, the process ID of its parent, its screen group, and whether the screen group is currently running in the foreground.

STRANGE SEGMENT ADDRESS

Under MS-DOS, a program is loaded into memory at the lowest free memory location that can accommodate the program. Depending on the presence of RAM-resident programs, disk buffers, device drivers, and so forth, the program's code and data segments can be almost anywhere within the 640K address space supported by MS-DOS.

Under OS/2, you'll find that code and data segments in programs always have the same segment addresses. For a small model program, these segment addresses are the following:

```

Local Info segment: 000Fh
Code segment:      001Fh
Data segment:      002Fh
Environment segment: 004Fh

```

To anyone accustomed to working with 8086 assembly language these segment addresses seem ridiculous. They make no sense at all.

But recall that, as we've previously learned, under protected mode these segment addresses are not physical addresses. They are selectors that reference a physical address through the program's Local Descriptor Table. Because each program running under OS/2 has its own LDT, each program can have a code segment with the same selector value. This selector value

■ ENVIRONMENTS

then references a different physical address for each program.

So there's nothing very strange going on here. But I guarantee that the first time you see these addresses in *CodeView* or another debugger, you'll do a double-take and wonder what's going on.

OTHER INFORMATORY CALLS

OS/2 also supports a number of additional functions that obtain information about the operating system and about the hardware of the computer. *DOSGETVERSION*, for example, will return the OS/2 version number.

You can use the *DOSDEVCONFIG* function to determine the hardware configuration of the computer, including the number of printers, RS-232 ports, floppy disk drives, the presence of an 80287 or 80387 math coprocessor, and the PC model and submodel codes. Some of this information was previously available from the PC BIOS interrupt 11h.

The *VIOGETCONFIG* function returns information about the video display adapter. One code identifies the video adapter type and another the monitor type. You can also obtain the amount of memory installed on the video adapter. In the documentation distributed with Microsoft's OS/2 Software Development Kit, only the IBM monochrome adapter, CGA, and EGA are listed, but there's plenty of room for expansion. (When programming for the OS/2 Windows Presentation Manager you don't need to determine the type of display hardware, since the Presentation Manager has a device-independent graphics interface.)

The *DOSGETMACHINEMODE* function tells you whether the program is running in protected mode or real mode. But wait a minute—surely that doesn't sound right. If we're writing programs for OS/2 protected mode, why do we need a function that tells us the mode we're currently running in?

Well, such a function might come in useful if you were to write a program that runs in both real mode and protected mode. Is this possible? Tune in next issue to find out.

Charles Petzold is a contributing editor of PC Magazine.

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■ RAY DUNCAN

POWER PROGRAMMING



Introducing a new column from an old hand, for readers who want to learn or to sharpen their skills in C and assembly language programming.

Power Programming is a new column designed specifically for the needs and interests of those *PC Magazine* readers who want to understand their machine and its software at the level of hands-on programming experience. In today's technical climate, what that means is that the column will address itself primarily to the ways and means of C and assembly language programming on IBM PC-compatible computers. What are these two languages, and why should they be discussed together?

Assembly language programs are written in symbols that are translated (by another program called an assembler) directly into the computer's machine instructions. Machine instructions are those bits in memory that tell the computer where to go, when to go there, and what to do when it arrives. Unlike such high-level languages as BASIC and Pascal, in which each line of source code is mapped to many machine operations, the ratio of assembly language statements to machine instructions is typically less than 1 to 1. This is because assembly language programs must also include many directives to control grouping of the machine code and data and the relationships between modules.

C is a "high-level" programming language invented at Bell Labs with the specific objective of replacing assembly language for power programming (i.e., the writing of operating systems, assemblers, compilers, and the like). Consequently, C is unusually rich in operators that manipulate bits, bytes, pointers, and data structures of all kinds. C allows the program-

mer to do almost anything he could do in assembly language—and frequently get it done faster. Originally, C went hand in hand with the UNIX operating system, and thanks to Bell Labs' generous licensing of UNIX to universities, it spread through academia like an epidemic. As students and professors came and went, C began to percolate into the broader community of programmers, and it has gradually become the language of choice for serious software developers on personal computers.

Both C and assembly language have the reputation of being difficult to code, read, document, and maintain. I believe, and intend to demonstrate, that this reputation is undeserved. A conscientious programmer can create readable, structured, maintainable programs in any language, and C and assembler are no exception. While these two may require *some* extra care and discipline, the speed and flexibility that result from their use are ample compensation.

■ Both C and assembly language have the reputation of being difficult to code, read, document, and maintain. This reputation is undeserved.

THE AGENDA The first half-dozen or so columns will present parallel introductions to assembler and C programming, and will demonstrate how programs are structured, assembled or compiled, linked, debugged, and optimized. We'll pay particular attention to the fundamental techniques you need to write a program that does something useful: display text; control the cursor position and character attributes; obtain input from the keyboard; open, read, and write disk files; and control program flow. Programming tricks, shortcuts, and puzzles do not particularly interest me and will receive short shrift here; I prefer code that does what it says and says what it does.

After covering the essentials, we'll adventure onward into larger, more elaborate projects. The initial domain of these efforts will be strictly MS-DOS, Version 2.0 and later, though we may pay some attention to OS/2 programming after reasonably priced languages become available for that system. I intend to emphasize the construction of programs that can be readily enhanced or modified to new purposes, illustrate salutary general principles, or at least contain broadly useful routines that can be lifted out of one program and dropped into another with a minimum of unexpected side effects. And, of course, I'll digress for a column or two if a new book or programming product appears that I feel deserves your attention.

THE TOOLS The time is right for this column because assembler and C programming tools have recently taken giant

■ POWER PROGRAMMING

leaps upward in capability and (dare I use the term?) user-friendliness. In the old days, the laborious cycle of edit, compile, link, crash, and debug was enough to drive even a saint to distraction. Nowadays, powerful windowing environments for programming and symbolic debugging have made the same process lightning fast and nearly painless.

For the purposes of this column I will be using Borland's Turbo C and Microsoft's Macro Assembler (MASM), Optimizing C Compiler, Quick C, and Code-View products. All three of the C compilers have particular strengths, but you will need only one—I'll try either to avoid code that is not compatible with all three or to spell out any dependencies. At present none of the other assemblers available for the PC have nearly the power, speed, or robustness of Microsoft MASM 4.0, so I will not attempt to provide for any alternatives to it. (I have, however, received a prerelease, beta-test copy of a compatible assembler from another vendor that may offer MASM some stiff competition when it eventually makes its appearance on the market.)

THE RESOURCES Unlike BASIC, effective programming in C or MASM requires that you have ready access to references on the Intel 8086/88/286 architecture and instruction set; the IBM PC BIOS, ports, and memory addresses; and the MS-DOS system calls. I particularly recommend the books listed below for their accuracy, style, and overall depth of coverage.

INTEL PROCESSOR REFERENCES:

The 8086 Book, by Russell Rector and George Alexy (Osborne/McGraw-Hill, Berkeley, Calif.; 1980). Though getting a bit long in the tooth (it has never been revised and updated for the 80286 and 80386 processors), it's still valuable for its encyclopedic coverage of the 8086 instruction set and addressing modes.

86/88 186/188 Programmer's Reference Manual (Order no. 210911) or the *80286/80287 Programmer's Reference Manual* (Order no. 210498) (Intel Corp., Santa Clara, Calif.; 1986). These are rarely found in bookstores, but can be ordered directly from Intel at (800) 548-4725.

REFERENCES:

The C Programming Language, by Brian W. Kernighan and Dennis M. Ritchie (Prentice-Hall Inc., Englewood Cliffs, N.J.; 1978). The ultimate arbiter on questions of C syntax and style. Not for casual reading, though every word is pregnant with meaning.

The C Programmer's Handbook, by M. I. Borsky (AT&T Bell Labs, Prentice-Hall Inc., Englewood Cliffs, N.J.; 1985). A handy quick reference to C syntax and standard library functions.

IBM PC AND MS-DOS REFERENCES:

Advanced MS-DOS, by Ray Duncan (Microsoft Press, Redmond, Wash.; 1986). Although this smacks of a plug, I can suggest this book with a perfectly clear conscience, since I wrote and tested every line of code in the book and I know that the routines work!

MS-DOS Developer's Guide, by John Angermeyer and Kevin Jaeger (Howard W. Sams & Co., Indianapolis, Ind.; 1986). A wide-ranging book, it covers some uncommon topics such as assembler macros, MS-DOS memory management, local area networks, and the Intel 8087/287 numeric coprocessor.

Programmer's Problem Solver for the IBM PC, XT, & AT, by Robert Jourdain (Brady/Prentice Hall, New York, N.Y.; 1986). Contains explanations and programming examples (often in both assembler and BASIC) for sound generation, interrupt handling, control of the video display, disk management, serial communications, the game port, and more.

The IBM PC from the Inside Out (second edition), by Murray Sargent III and Richard L. Shoemaker (Addison-Wesley Publishing Co. Inc., Reading, Mass.; 1986). An interesting book with a special emphasis on the hardware and how it works. Make sure you get the second (revised) edition, which includes PC/AT coverage.

Using PC-DOS, by Chris Devoney (Que Corp., Indianapolis, Ind.; 1986). Not a programming book, but a thorough and reliable guide to MS-DOS/PC-DOS commands, utilities, and batch file and configuration file directives, including explanations of error messages and version dependencies. The book to reach for at 3

A.M. when your befuddled brain can no longer remember the switches for BACK-UP and RESTORE.

Aside from reference books, there are a host of C and assembler tutorials in print. One of these (C or MASM, depending on your interest) may prove helpful as an adjunct to the upcoming columns. I especially recommend the following:

Assembly Language Primer for the IBM PC and XT, by Robert Lafore (New American Library, New York, N.Y.; 1984).

8088 Macro Assembler Programming, by Dan Rollins (Macmillan Publishing Co., New York, N.Y.; 1985).

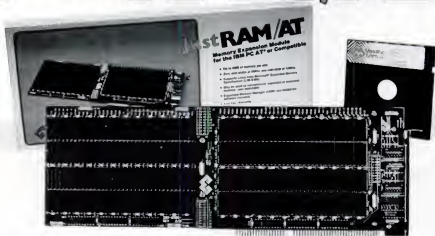
Microsoft C Programming for the IBM, by Robert Lafore (Howard K. Sams & Co., Indianapolis, Ind.; 1987). An excellent methodical introduction to C, specifically oriented to the IBM PC.

THE IN-BOX Although I have a general idea of what I'd like to cover in this column for the next year or so, I hope to hear from you when you have special topics you want discussed, when you wish to contribute suggestions, programs, or just snippets of code, or if you feel that I'm veering off course. You can send me your comments the old-fashioned way, by writing to *PC Magazine*, but such letters may or may not get answered depending on the pressure of other work.

A superior method of communication, and one to which I guarantee a rapid response, is electronic mail. You can reach me via BIX (rduncan), CompuServe (72406,1577), or MCI Mail (lmi).

Ray Duncan is the owner of Laboratory Microsystems Inc., a small software house in Los Angeles specializing in Fortran interpreters and compilers. His programming background includes experience with assembly language, Fortran, and C on the Raytheon 703, the PDP-11, and nearly every commonly used 8- and 16-bit microprocessor. He has previously written regular columns for Softalk/PC and Dr. Dobb's Journal, and has also contributed articles to Byte, PC Tech Journal, the Seybold Report on Professional Computing, Programmers Journal, and Microsoft Systems Journal. He is the author of Advanced MS-DOS (Microsoft Press, 1986).

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■ JARED TAYLOR

SPREADSHEET CLINIC



Password protection for the forgetful; mainframe dating compatibility with 1-2-3; underlining labels and using them with multicell ranges; a clean approach to finding print range width.

UNDERLINING LABELS

In the Spreadsheet Clinic of June 23, 1987 (Volume 6 Number 12), you presented a manual method for underlining labels in 1-2-3 spreadsheets. [In Volume 6 Number 18 we also included a macro that did underlining.—Ed.]

My preference is for formulas. The double underscore in cells C4 and C10 of Figure 1 are the displays that result from the formulas reproduced in C6 and C12. The practical difference between the two formulas is that the shorter one will not correctly underline a label with leading spaces. The longer formula may seem complicated, but you have to write it only once and then copy it to wherever you need it. Then any label you enter in cells C3 and C9 will be underlined properly.

I keep a number of long formulas, such as this one, in a library file. Each formula has an appropriate name, and whenever I need it I just combine it into my current spreadsheet.

Ilene G. Radish
Brooklyn, New York

Ain't string functions grand? These are good formulas, but don't try to use them on centered or right-aligned labels.

Ms. Radish's formula library is also a good idea. I keep a macro library that works the same way. The only trick is to give a range name to the entire macro script, not just to the first cell. That way you can combine the whole thing right into your current worksheet.

PRINT RANGE WIDTH

While Spreadsheet Clinic has run several submissions on how to find the width of a 1-2-3 print range, they generally leave a bunch of @cell("width") formulas lying around the spreadsheet. The macro in Figure 2 lets you move quickly from column to column of your print range, while a running total of the range width appears in the mode indicator in the upper-right-hand corner of the screen.

Start with the cursor at the leftmost column of the print range. Hit Alt-W. Then hit Enter repeatedly to move the cursor one column to the right and increment the print

range width. Hit Ctrl-Break with the cursor on the last column of the print range. The total width of the range will appear in the mode indicator. Be sure to give the range names in the left-hand column to the cells to their right.

Rod Schindler
Renton, Washington

This is the first macro I've seen that uses the mode indicator to display calculations. It is a very clever technique that works because of the formula in the third line of the macro. It uses the label in INSTRING as a template, into which it inserts a string conversion of the value stored in TEMP. That value is the accumulated widths of all the columns the user moves the cursor through by hitting Enter. The addition of these widths takes place at LOOP, which increments TEMP by the width of the new column. You can use the same template technique to display all kinds of interesting information.

The [onerror] at the beginning of the macro anticipates a Ctrl-Break rather than a more conventional error. Ctrl-Break, like an error, makes macro execution branch to the specified location, in this case, ERROR. ERROR is a one-line routine that cleans up after the macro by restoring the mode indicator to its normal status and erasing the accumulated value in TEMP.

The fourth and fifth lines of the macro appear in the control panel when you run the macro and every time you hit Enter to add a column. They act as a prompt and also tell you that the print range width is

	C	D	E
3	This string is not indented		
4	_____		
5			
6	=REPEAT("-",@LENGTH(C3))		
7			
8			
9	This string is indented		
10	_____		
11			
12	=REPEAT(" ",@LENGTH(C9)-@LENGTH(@TRIM(C9)))+@REPEAT("-",@LENGTH(@TRIM(C9)))		
13			

Figure 1: Formulas that underline labels in 1-2-3.

■ SPREADSHEET CLINIC

```

\W      (onerror ERROR)"
LOOP    {let TEMP,TEMP+@cellpointer("width"))"  Increment width.
                                                See formula below.
(indicate #)
press enter for next column
control-break to stop  WIDTH ==>
(?)@ac)"(right)/xgLOOP"  These prompt lines
(indicate)"/reTEMP"/xq  are not necessary.
                        Move right, loop.
                        Clean up.
TEMP    {indicate }      Indicate template.
                        Width accumulator.

Formule in third line of macro:

@replace(INSTRNG,12,#,@string(TEMP,#))

```

Figure 2: A 1-2-3 macro that displays the width of a print range in the mode indicator.

displayed to the right. Since it takes the macro processor a little time to type these characters into the control panel, they do slow the macro down. If you eliminate them, you won't have a prompt, but you'll have a quicker macro.

THE DATING GAME

I have been using 1-2-3 ever since it was released and have always been infuriated by the way Lotus makes you enter dates. Over the years I more or less got used to it. However, I now supervise people who must work with both PCs and a mainframe, and I got tired of having to explain to them that dates are entered MMDDYY on the mainframe and @date (YY,MM,DD) on the PC.

The macro in Figure 3 solves the problem by letting you enter a date as MMDDYY with no commas or slashes. Just put the cursor on the cell where the date should be and type it in. The names in the leftmost column of the macro are the range names for the cells to their right. The range name DATES includes three cells: MONTH, DAY, and YEAR. These cells contain the formulas to their right. If you

add a line like {down}{branch \D} to the end of the macro, you can make it loop for continued date entry.

Having to write macros like this is a lot of trouble, but it will have to do until Lotus wakes up and gives us a better date format.

Bobby Trickey
Little Rock, Arkansas

People have been complaining about the Lotus date format since the day 1-2-3 was released. I wonder if Lotus will change it in Release 3.0, or stick to its odd convention in the name of compatibility.

The only change I would make to Mr. Trickey's macro is to add a second line that gives a date format to the current cell.

A simpler solution, but one that doesn't result in complete micro-mainframe compatibility, is the macro below.

```

\D      /rfd1"@date(87,{?})"
        {down}{branch \d}

```

It date-formats the current cell and then enters most of the @date function for you. You do have to enter the month and day, separated by commas, but at least you can forget about the @ character, parenthe-

ses, and year. As an added bonus, you can rewrite it with the /xg command to make it work in Release 1A.

LABELS AS RANGE NAMES

The /Range Name Label command in 1-2-3 is very handy when you need to use a series of labels as range names for single cells. You can use the command to name cells above or below, or to the right or left of the current cell.

However, there may be times when you would like to use an equally quick technique to give a name to a multicell range. The macro shown in Figure 4 lets you do this. Just put the cursor on the cell containing the range label you want to use and hit Alt-D. The macro will give that name to the five cells to the label's right. In this case, the cell is labeled PROFITS.

Steve Ropiak
Sanford, Maine

```

\D      {let NAME,@cellpointer("contents"))
        /rsc
        PROFITS
        "{ac}"(right).{right 4}

```

Figure 4: A macro that applies the label in the current cell as a range name to the five cells to its right.

It is the last line of this macro that determines which cells will become part of the multicell range. After the period in that line, you can include whatever cursor movements are necessary to define the range. Since the macro has no cell references, you can use it repeatedly to give names to similarly shaped ranges.

However, it's still not quite as convenient as /Range Name Label—you can't simultaneously name a whole group of ranges, as with the built-in command.

SECURING SPREADSHEETS

Spreadsheet security is important, and Lotus did well to add password protection in Release 2.0 of 1-2-3. However, should you forget your password, there's no way to get your data back.

From time to time in Spreadsheet Clinic I have seen different macro-based security techniques, but I like the one I've written better. The Release 2 macro in Figure 5 is an autoexec that first disables Ctrl-Break

```

\D      {GETLABEL ENTER DATE [MMDDYY] [# TO QUIT] > ,DATESTR}
        {if DATESTR="*" }{quit}
        {recalc DATES}@date(YEAR,MONTH,DAY)"
        {edit}{calc}"

MONTH    11    <====  @value(@mid(DATESTR,8,2))
DAY      3     <====  @value(@mid(DATESTR,2,2))
YEAR     87    <====  @value(@mid(DATESTR,4,2))
DATESTR  110387

83-Nov-87      Range name DATES is the three cells
                MONTH, DAY, and YEAR.

```

Figure 3: A macro that lets you enter dates in the form MMDDYY.

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R01 [DMS] DATA

MONTH	REGION	PRODUCT	UNITS	SALES \$
Jan-87	East	Lumber	43	\$72,100
Feb-87	East	Lumber	104	\$171,740
Total for East			147	\$243,840
East Region			43	\$72,100
Feb-87			104	\$171,740
Total for Feb-87			147	\$243,840
West Region			43	\$72,100
Feb-87			104	\$171,740

Hit a few keys—see Sales by Product

R02 DATA

MONTH	REGION	PRODUCT	UNITS	SALES \$
Jan-87	East	Lumber	43	\$72,100
Feb-87	East	Lumber	104	\$171,740
Total for East			147	\$243,840
East Region			43	\$72,100
Feb-87			104	\$171,740
Total for Feb-87			147	\$243,840
West Region			43	\$72,100
Feb-87			104	\$171,740

Hit another key—see Sales by Region

R03 DATA

MONTH	REGION	PRODUCT	UNITS	SALES \$
Jan-87	East	Lumber	43	\$72,100
Feb-87	East	Lumber	104	\$171,740
Total for East			147	\$243,840
East Region			43	\$72,100
Feb-87			104	\$171,740
Total for Feb-87			147	\$243,840
West Region			43	\$72,100
Feb-87			104	\$171,740

Hit another key—see Sales by Month

Windows present data from multiple databases

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■ SPREADSHEET CLINIC

so that the macro can't be interrupted. It sends the cursor to cell IV8192 so as to blank the screen and then prompts the user for a password, which it stores in the range PWORDIN. The actual password, the word "banana" in this case, is in the range MYWORD. In a real spreadsheet you might choose to leave the range unidentified and tuck it out of the way. The macro compares PWORDIN with MYWORD. If they match, you get access; if they don't, the macro erases the spreadsheet.

Obviously, this isn't bulletproof security. Its advantage, though, is that all is not lost if you forget your password. If you remember only that the range name MYWORD contains the password, you can do a /File Combine Copy Named/Specified-Range and ask for the range MYWORD. 1-2-3 will obligingly give you the password.

If you can't even remember MYWORD, or if you are trying to break

```

18 (L...=OFF)(GOTO IV8192"
    (GOTO "Enter Password "PWORDIN")
    (IF PWORDIN=MYWORD) (GOTO)
    (GOTO PWORDIN) (home)

:MYWORD /my
PWORDIN
RETURN BANANA
  
```

Figure 5: A simple macro for securing spreadsheets.

the security system, you can Combine Copy the whole file and get around the autoexec macro. That's the obvious weakness in this method, but not many users are likely to think of it.

Michael King
Lebanon, Tennessee

I was surprised to find that, no matter how hard I tried, I couldn't beat the {breakoff} command with a quick Ctrl-Break. When it's the first command in an autoexec macro there seems to be no way to defeat it.

The result is a good, low-level security system, but I would still do two things differently. First, I would get rid of the "Enter Password" prompt, because it suggests some means of access and hints at valuable data. A blank screen is more baffling. The second thing I would do is change the WIPEOUT routine from /wey to /ay. I'd throw the snooping blackguards right out of the program.

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Jared Taylor is West Coast editor of PC Magazine.

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■ PAUL SOMERSON



USER-TO-USER

Teach batch files to sniff out valid drives and execute time-sensitive programs on specific days of the week or month; create a dazzling program to exercise your color monitor.

DRIVING RANGE

In a recent PC Tutor (Volume 6 Number 7), a reader inquired about determining the highest installed drive. Though Charles Petzold's answer was accurate, it only hinted at the complete solution. The GETLAST.SCR script in Figure 1 will create GETLAST.COM, which returns the last valid drive as a DOS ERRORLEVEL. Create GETLAST.SCR with a pure-ASCII word processor or the DOS COPY CON command. Hit the Enter key after each line, especially the last one (with the Q)—and be sure to leave a blank line above RCX. Then put the script file on the same disk as DEBUG (Version 2.0 or later) and type

DEBUG < GETLAST.SCR

It begins by first saving the current drive, and then attempting to make successively higher drive letters the default. Since DOS does not indicate an error when a program attempts to set an invalid drive, the only way to tell if it really worked is to ask for the current drive again. Once GETLAST has determined the last drive, it restores the original drive, and then uses DOS function 4Ch to exit with ERRORLEVEL holding the result.

Since ERRORLEVEL will be set to 0 if it's drive A:, 1 if it's B:, etc., any batch file can easily test which drive is last, as shown in the GL.BAT batch file in Figure 2.

Ethan Winer
East Norwalk, Connecticut

This will indeed report the last consecutive drive. If you're using four drives (A:

N GETLAST.COM

```
A
MOV AH,19 ;get current drive service
INT 21 ;call DOS to do it
MOV BL,AL ;save current drive in BL
MOV DL,AL ;and in DL too
INC DL ;attempt to set next higher
MOV AH,0E ;set drive service
INT 21 ;call DOS to do it
MOV AH,19 ;now get the drive again
INT 21
CMP AL,DL ;did it take?
JNZ 118 ;no, restore drive and exit
JMP 108 ;yes, keep trying
MOV CL,AL ;save last valid drive in CL
MOV DL,BL ;now specify original drive
MOV AH,0E ;set it back again
INT 21 ;call DOS
MOV AL,CL ;get last valid drive again
MOV AH,4C ;exit with it as ERRORLEVEL
INT 21
```

RCX

26

W

Q

Figure 1: GETLAST.SCR script to create GETLAST.COM, which returns the last valid drive as a DOS ERRORLEVEL. Create it with a pure-ASCII word processor or the DOS COPY CON command. Hit the Enter key after each line, especially the last one (with the Q)—and leave a blank line above RCX. Then put GETLAST.SCR on the same disk as DEBUG.COM (2.0 or later) and type DEBUG < GETLAST.SCR. Running GETLAST.COM by itself won't do anything (although it won't hurt anything either). To put it to work and have it report your last consecutive drive, create and run the short GL.BAT batch file in Figure 2.

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■ USER-TO-USER

```
ECHO OFF
GETLAST
ECHO VALID DRIVES:
ECHO A
IF ERRORLEVEL 1 ECHO B
IF ERRORLEVEL 2 ECHO C
IF ERRORLEVEL 3 ECHO D
IF ERRORLEVEL 4 ECHO E
IF ERRORLEVEL 5 ECHO F
```

Figure 2: Sample GL.BAT batch file to demonstrate GETLAST.COM, which returns the last valid drive as a DOS ERRORLEVEL. This example will scan your system and figure out the last continuous drive, but as shown it will stop at drive F:. Add more tests if you want to go higher.

through D:) and you issue the DOS 3.1 or later command

SUBST E: \DOS

GL will find and report all five drives. But if you leave a gap, and instead of typing the above command, type

SUBST F: \DOS

```

100 ' Program for creating DASZLER.COM -- by Paul Carlson
110 PRINT "Checking DATA statements; please wait..."
120 FOR B=1 TO 15:FOR C=1 TO 17:READ A$:IF C<17 THEN 140
130 I$=B$+VAL(A$)
140 NEXT:NEXT:IF I$=29323 THEN RESTORE:GOTO 170
150 PRINT "ERROR - CHECK THE LAST NUMBER IN EACH"
160 PRINT "DATA STATEMENT, THEN REDO":END
170 FOR B=1 TO 15:FOR C=1 TO 16:READ A$:TTL=TTL+VAL("6B"+A$)
180 NEXT:READ B:I$=B-TTL THEN 200
190 PRINT "ERROR IN LINE":B=1+220: - CHECK AND REDO":END
200 TTL=0:NEXT:RESTORE:OPEN "DASZLER.COM" AS $1 LEN=1:FIELD $1 AS D$
210 FOR B=1 TO 15:FOR C=1 TO 16:READ A$:LSET D$=CHR$(VAL("6B"+A$))+D$
220 FUT $1:NEXT:READ DUMMYS:NEXT:PRINT "DASZLER.COM CREATED":CLOSE:END
230 DATA 88,01,00,CD,1B,08,00,08,0E,0C,0B,0D,0A,08,0E,08,0B,1828
240 DATA 7A,0A,02,01,84,03,87,0B,0C,01,07,01,07,03,09,0B,2054
250 DATA CF,0B,00,00,7E,CA,08,04,0F,0B,09,03,0B,AB,01,07,2356
260 DATA 7E,07,AB,08,09,03,07,4E,2B,07,AB,01,07,07,07,AB,2453
270 DATA 0B,09,07,0F,01,01,07,08,07,03,0B,AB,01,07,07,07,AB,2506
280 DATA 0B,09,07,0F,01,07,08,07,07,2B,07,AB,01,07,07,07,AB,2624
290 DATA 03,C3,02,03,CF,28,74,02,0E,BA,42,03,FA,0D,74,02,1867
300 DATA 0E,9D,0B,01,00,0E,00,00,01,0F,01,08,07,0B,01,1478
310 DATA 0E,0B,01,0B,05,0B,01,00,08,08,0B,09,0B,08,03,26,1637
320 DATA 0A,35,7E,C6,79,02,06,0F,08,0E,06,26,08,35,47,1705
330 DATA E2,0D,04,05,0D,10,09,01,27,02,7E,03,0F,01,74,15,2097
340 DATA 04,06,02,FF,0C,21,3C,20,75,23,01,0F,01,08,07,04,1651
350 DATA 0B,01,0B,0B,03,0E,00,00,08,00,03,01,06,74,07,06,1652
360 DATA 06,03,01,0C,0E,AB,02,06,06,03,01,0E,0B,0B,3C,10,75,1901
370 DATA 07,00,03,00,0C,10,01,00,08,00,08,00,08,00,08,08,754

```

GL will stop when it reaches the first "invalid" drive and report only four.

COLOR EXERCISES

The DAZZLER.COM program created by DAZZLER.BAS in Figure 3 or DAZZLER.ASM in Figure 4 is an example of a self-modifying program that saves a lot of code. It will run on color systems only.

When the program starts it creates a pattern on screen. Hitting the Spacebar toggles an opcode from INC to DEC (or vice versa) which reverses the direction of the pattern's movement. Hitting Esc exits.

The program works by creating a pattern in the first two video pages. Then, alternating between pages 0 and 1, it increments or decrements every character's color on the inactive page and makes the inactive page the active page. The program would have been considerably shorter without so much page swapping, but this method prevents CGA flicker.

The speed is controlled by the number 27 in line 330 of the BASIC DAZZLER.BAS program. If you change it, change two checksums—in lines 330 and 140.

Paul W. Carlson
Williston, Vermont

Figure 3: DAZZLER.BAS file to create DAZZLER.COM (for color systems only)

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■ USER-TO-USER

	PROGRAM: CASILIER	ADD	D1,78	rdi = 88 + row * 8
1	AUTHOR: PAUL M. CARLOW	SUB	D1,88	rdi = 88 + row * column + 8
		STOSB		store word to page 0
CS00	SEGMENT PARA PUBLIC 'CODE'	ADD	D1,2846	
	ASSUME CS:CODE,DS:CODE,ES:CODE,ESI:NOTHING	STOSB		store word to page 1
	ORG 0	MOV	D1,CX	rdi = 88 + row
ES00:	MOV AX,0010	NEG	D1	rdi = - 88 + row
	INT 10H	ADD	D1,1920	rdi = - 88 + row * 1920
	MOV AX,00FFFF	ADD	D1,88	rdi = - 88 + row * column + 1920
	MOV ES,AX	STOSB		store word to page 0
		ADD	D1,2846	
2	Put the pattern into video pages 0 and 1	STOSB		store word to page 1
		MOV	D1,CX	rdi = 88 + row
	MOV AL,7FH	MOVB	D1	rdi = - 88 + row
	MOV CX,0	ADD	D1,1940	rdi = - 88 + row * 1940
RL00:	MOV DI,0000	SUB	D1,88	rdi = 88 + row * column + 1940
	MOV AH,7F	STOSB		store word to page 0
	MOV CL,8	ADD	D1,2846	
	SAL 01,CL	STOSB		store word to page 1
	MOV CX,01	ADD	88,7	increment column
	DI,1	CMF	88,88	column done?
	SAL 01,1	JE	CX=00	yes, check row
	ADD 01,CX	JMP	CLOOP	row, next column
	CLD,01	JMP	88,88	increment row
	MOV 88,0	CMF	DX,13	row done?
CL00:	INC AX	JE	MOVIT	yes, move the pattern
	AND AX,1F	JMP	RL00F	no, next row
	MOV DI,CX			
	ADD 01,88			rdi = 88 + row * column
	STOSB			store word to page 0
	ADD D1,2846			
	STOSB			store word to page 1
	MOV DI,CX	MOVIT:	MOV 88,2869	yes + page offset
		MOV	81,0	flag to no swap

Figure 4: *DAZZLER.ASM* to create *DAZZLER.COM* (for color systems only).

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[illegible]

(Figure 4 ends)

Actually, if you want to change the speed, it's easier to create the program as is and then alter it later with DEBUG. The speed address is 1A8. Lowering the number speeds things up.

CLOCKWORK EXECUTION

A friend recently asked for an easy way to execute a specific program at boot-up on a specific day. The idea was to run **CHKDSK.COM** once each week and

Norton's DISKTEST.EXE once each month to monitor the condition of a fixed drive.

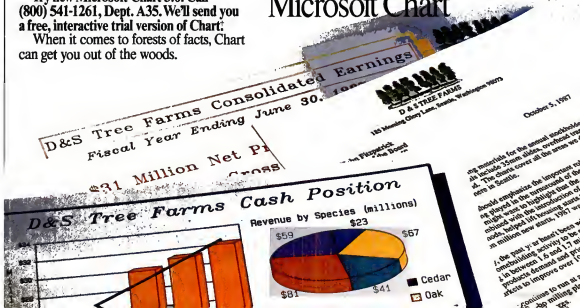
The DATECHEK.COM program (which is generated by the DATE-

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CHEK.SCR DEBUG script in Figure 5 below) and the CHKDATE.BAT batch file in Figure 6 demonstrate just how simple this process is.

Type in the DATECHEK.SCR script using either a pure-ASCII word processor or the DOS COPY CON command (omitting the semicolons and the text following them). Hit the Enter key after each line, especially the last one (with the Q), and be sure that you leave a blank line above RCX. Put this and DEBUG.COM (Version 2.0 or later) on the same directory and then type

DEBUG < DATECHEK.SCR

The program requests the system date via function 2AH, looks for the day of the week and, if it is Tuesday, then checks to see if it is the first Tuesday of the month. The program terminates with function

N DATECHEK.COM

```
A
MOV AH,2A      ; Get date
INT 21
CMP AL,02      ; Is it Tues?
JNZ 0113       ; No, AL=2
MOV AL,00      ; Yes, AL=0
CMP DL,08      ; First week?
JNB 0115       ; No, AL=8
MOV AL,01      ; Yes, AL=1
JMP 0115
MOV AL,02      ; Set level
MOV AH,4C      ; Terminate
INT 21
```

RCX

19

W

Q

Figure 5: DATECHEK.SCR script to create DATECHEK.COM. This checks for Tuesday; for another day, change the CMP AL,02 line (0=Sun, 1=Mon, 2=Tues, etc.). Type this in using a pure-ASCII word processor or the DOS COPY CON command (omit the semicolons and the text following them). Hit Enter after each line, especially the last one (with the Q), and be sure to leave a blank line above RCX. Put this and DEBUG.COM (Version 2.0 or later) on the same directory and type DEBUG < DATECHEK.SCR




```

ECHO OFF
DATECHK
IF ERRORLEVEL 2 GOTO 2
IF ERRORLEVEL 1 GOTO 1
ECHO It's Tues (not the 1st)
GOTO END
:2
ECHO It's not Tuesday
GOTO END
:1
ECHO It's the first Tuesday
:END

```

Figure 6: Demonstration CHKDATE.BAT batch file that uses IF ERRORLEVEL to test the return code generated by DATECHK.COM. Substitute your own commands for the ECHO messages shown.

4CH, which returns a value in AL that the IF ERRORLEVEL command can test in a batch file.

You can alter the day of the week to be tested by changing the

CMP AL, 02

line in the listing (00 = Sun, 02 = Tues, 06 = Sat). The day of the month is reported in DL. Tuesday was chosen to avoid missing the monthly test due to a holiday (July 4 and January 1 present problems only infrequently).

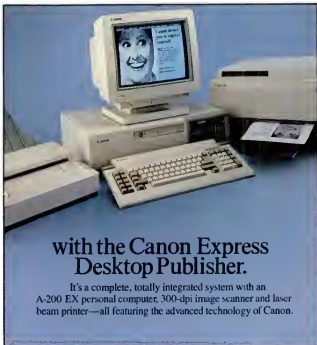
CHKDATE.BAT uses the ERRORLEVEL returned by DATECHK.COM to branch to the appropriate test. It's a dummy file for demonstration purposes; substitute your own commands for the "ECHO It's Tues (not the 1st)", etc., messages shown in the example.

Patrick R. McClintock
Bethesda, Maryland

Paul Somerson is an executive editor of PC Magazine.

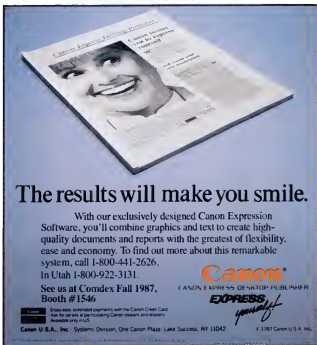
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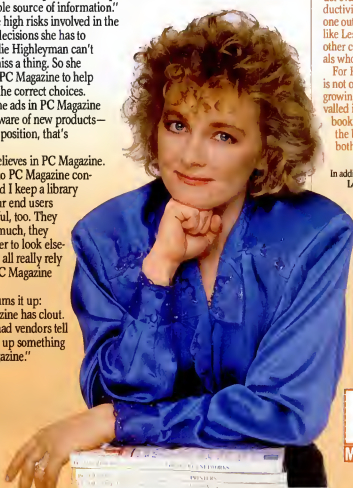
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■ EDITED BY CRAIG L. STARK

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NONBLINKING CURSOR

Microsoft Word's graphics mode is painfully slow on 8088-based computers. The text mode is faster, but the blinking mouse cursor is too distracting for extended use. Here is a patch for Word 3.1 that keeps the mouse cursor from blinking in text mode.

Starting with DEBUG and a backup working copy of WORD.COM, Version 3.1, enter the lines below, ending each with a carriage return and putting the single space shown between the 90s.

DEBUG WORD.COM

o 29E6

90 90 90 90 90

w

q

This patched version of WORD.COM will give you the speed of Word's text mode, but with a solid, nonblinking cursor on-screen.

Charles Miller
San Jose, California

For those who can't stand blinking cursors, this is a program-saving patch. Before making it, however, it's a good idea to double-check exactly what you're changing, since many software houses make minor changes to programs without changing the release number. Before editing WORD.COM with the o 29E6 command, first do a search for the five bytes you want to change by issuing the command

S 0000 FFFF B8 0A 00 CD 33

DEBUG will respond with a memory address in the form xxxx:YYYY. Ignore the

xxxx. Use the YYYY as the memory address for the e (enter) command in the second line of Mr. Miller's procedure. My copy of Word 3.1 did match the 29E6 address that Miller gives. Word 3.0 gave an address of 2873. Entered at the correct address, the patch works for both versions.

—M. David Stone

SELF-MANAGEMENT

When you make changes in a SuperKey macro file and choose the Macro Save command, the program forces you to reenter the name of the file to save to. If you misremember the filename, you wind up cluttering your disk with nearly duplicate macro files with similar names. However, if you create a macro key to save the file automatically, you'll never have to remember a macro filename again.

Pick an unusual key combination that you can use with all of your macro files—Ctrl-` (the Control key plus the reverse ac-

cent or backquote) is a good choice. Now load SuperKey and go to the macro editor and type in the following set of commands:

Alt-`	SuperKey menu
M	Macro submenu
D	eDit key command
Ctrl-`	key to be edited

At the macro editor, type

<CMD>MSfilename<CMD>

The <CMD> markers tell SuperKey that the characters between the markers are an internal command. MS invokes the macro save command. Filename specifies the macro filename. Next type

Alt-Esc
Y

to exit from the editor and save the new macro.

Now whenever you want to save changes to your macro file, all you have to do is type Ctrl-`. SuperKey will ask if you want to overwrite the file. Answer Y, and it's done. Whenever you create a new macro file, start from an existing one, edit the save macro to change the filename, and add or remove macros as needed.

Robert Patenaude
Pierrefonds, Quebec
Canada

This is an elegant solution to a sticky problem. Ideally, SuperKey should default to the current macro filename when saving macros. Since it doesn't, Mr. Patenaude's macro serves the same purpose. You might

■ If you create a macro key to save a SuperKey macro file automatically, you'll never have to remember a macro filename again.

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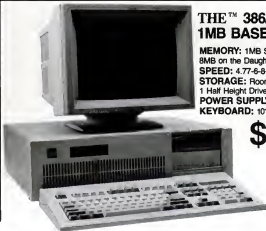
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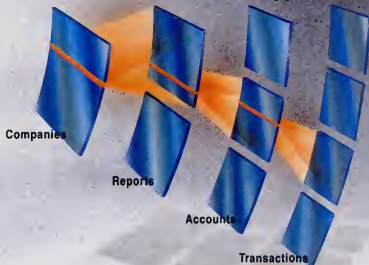
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■ POWER USER

want to create a special macro file that contains only the save macro, and use that as the starting point for creating new macro files.—M. David Stone [As if to illustrate another sticky problem, Mr. Patenaude's choice of an "unusual" key combination (Ctrl-') happens to be used for Robert L. Hummel's excellent SPECTRUM.COM program in our Utilities column, Volume 6 Number 12.—Ed.]

SINGLE-PASS STATISTICS

I often need to produce summary total and subtotal reports on the contents of character and/or date fields. The COUNT command in dBASE III PLUS requires you to pass the whole file to derive a single total, so if you need to know how many people responded "Y", "N", and "?" to a questionnaire, you have to COUNT the whole database three times. Then, of course, you must format this information for the report. If you're COUNTING subtotals for 20-part numbers, it takes forever.

To get all these statistics in one file pass—and nicely formatted, besides—try this method. Start by indexing your file on the field you will be COUNTING. Then CREATE REPORT FORM filename. Answer Y to the "Summary report only?" query in the Group/Subtotal screen. Finally, for the report's columns, use the AT() function to convert the existence of a specific character into a numeral—1 or 0—and total on this field. For example, if you have a one-character field called Ans that is filled with either "Y", "N", "?", or nothing (no response), the Contents and Headings of your four columns would be

AT("Y",Ans)	Yes
AT("N",Ans)	No
AT("?",Ans)	No Opinion
AT(" ",Ans)	No Response

A one-character field can be tested and tallied for any value using this method. A larger character string can be tested by adding the SUBSTR() function.

The corresponding function to return a 1 if a date has been entered and a 0 if the date field is blank is

(MONTH(date_fld))*8

The MONTH() function returns an integer from 1 to 12 for any valid date, which, taken to the 0 power, is 1. MONTH() returns

a 0 if the date field is blank or invalid, and this to the 0th is still 0.

These tallies can be subtotaled and sub-subtotaled in the normal way. A grand-total-only report can be generated by using C. O. Brown's trick of entering "" in the group subtotal field (Power User, Volume 5 Number 15).

Robert L. Marcus
Wantagh, New York

This is a flawless gem for any dBASE III Plus user who needs summary statistics, and Mr. Marcus's clear white diamond works equally well on numeric and logic fields using the immediate IIF().

Suppose, for example, that you want to analyze the number of employees of your company's 2,000 clients to get a better handle on who buys your product. The following Contents and Headings might reveal important information:

IIF(emp<10,1,0)	Under 10
IIF(emp>9.AND.emp<100,1,0)	10-99
IIF(emp>99.AND.emp<1000,1,0)	100-999
IIF(emp>1000,1,0)	1000+
IIF(.T.,1,0)	Total

Note the expression to get the total. Since .T. is definitely always True, IIF(.T.,1,0) effectively COUNTS each record. (In fact, as I later discovered, you could replace the last IIF statement with a numeral 1 and achieve the same result.)

For dBASE II and III users who don't have the luxury of AT() and IIF() functions, try adding a special numeric field to your database, put a numeric 1 into every record, and total on this field to get multiple COUNTS—I've received several letters suggesting this technique.—Brad Stark

RENUMBERING FOOTNOTES

Microsoft Word will automatically renumber footnotes if they were numbered automatically in the first place. But if you numbered the footnotes manually and then need to renumber after adding or deleting a footnote, here's the best way I've found. In the body of the document, highlight the footnote reference that needs changing. Now hit Esc-FF (for Format Footnote), enter the new reference number, and hit the Return key. The reference number on the footnote doesn't change, so hit Esc-JF (for Jump Footnote) and you'll be on the right footnote, even though the number is

wrong. Now overtype the number on the footnote and hit Esc-JF to go back to the text. Use the arrow key to move forward one space from the reference number, hit Esc-JF to move to the next footnote reference, and repeat.

Julie Downs
Portland, Oregon

To my way of thinking, the awkwardness of this procedure just underscores the value of using the automatic numbering feature in the first place. The only excuse for not using automatic numbering is if you're following an unusual reference scheme for your footnotes. If you have gotten yourself in this box, however, it's relatively easy to reformat the footnotes for automatic numbering.

First, for each footnote in the body of the document, highlight the footnote reference, hit Esc-FF<Enter>, then hit Right Arrow-Esc-JF to go to the next footnote. This will automate the numbering within the text but leaves the numbers on the footnotes themselves unchanged.

Next type the word "footnote," highlight it, and hit Esc-DF<Enter> to store it in the glossary definition F. Then go to the footnotes themselves, and for each footnote reference, highlight the number, delete it with the Del key, and type

f<F3><F3>

The first F3 command (expand glossary name) converts f to "footnote," which is a reserved glossary word. The second F3 converts "footnote" to an automatically numbered footnote reference, which will match the appropriate number in the text.

Finally, note that the repetitiveness of this task makes it a perfect candidate for automating the task itself with a keyboard macro—assuming you have ProKey, SuperKey, or the like.—M. David Stone

MODEL 100 TRANSFERS

Here's a cheap and easy way to transfer text files from a Tandy Model 100 to a PC. First, connect the two computers with a null modem cable. Then, on the PC side, use the MODE command to initialize the comm port. Assuming you want to use COM2 at 9600 bps, the command is

MODE COM2:9600,N,8,1

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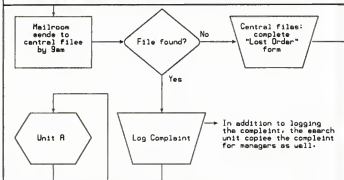
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■ POWER USER

Next, on the Model 100, use the Stat option in the Telcom program to match these settings. In this case, use

88N1E

Now, to copy from the Model 100 to the PC, enter the following at the DOS command line on the PC:

COPY COM2: filename

At the Model 100, select the Term option from the Telcom program, then select Up (Upload), and enter the filename to upload. For maximum line width, enter 65. The Up menu option will appear in reverse video on the Model 100 as the file is uploaded to the PC. After the reverse video switches back to normal, press Ctrl-Z on the Model 100 to send the end-of-file marker to the PC. The PC will display the message "1 file(s) copied" and will return to the DOS prompt. If the file does not transfer accurately, try it again, using a slower bps setting.

Once you've established the proper settings, file transfer will be almost trivial.

Dr. Michael R. Milligan
Westminster, Colorado

On my NEC 8200, the Telcom setting is 88N1XN, and there is no prompt for maximum line width in uploading the file. Otherwise, this trick works on the NEC 8200 as well as the Model 100. Once you establish the fastest speed you can use, you might like to put the mode command in a batch file in order to save typing it each time.—M. David Stone

EGA GRAPHICS AND SIDEKICK

Like Dwight Underhill (Power User, Volume 6 Number 12) I've encountered a problem when using **SideKick** and **Microsoft Word** with EGA graphics. **SideKick** and **Word** both run properly, but calling up **SideKick** messes up the screen on return to **Word**. The same problem appears when using **SideKick** together with **Reflex** or **ProDesign II**.

My solution is to call up **SideKick** from within the program and let it mess up the screen on return. Then I briefly call the help screen, which is a text screen in each of these programs. The programs reset the screen mode when you exit the help screen, so the screen is restored to normal.




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■ POWER USER

This procedure is a little faster than Underhill's. With *Word*, for example, you just hit Esc-H<Enter> instead of using the Library Run command followed by a harmless DOS command such as DATE or TIME. The technique also works with programs that don't have the equivalent of the Library Run command.

Michael Eldridge
San Jose, California

As a general rule, anything that forces a program to rewrite the EGA graphics screen should clean up any garbage left behind by SideKick or other TSR programs. Ideally, the program will have a command for rewriting the screen—something comparable to the (admittedly awkward) three-key Ctrl-Shift-Backslash command Microsoft added to Word, Version 3.1. For programs that lack this feature, including Word 3.0 and earlier, you can usually find other ways to force the screen rewrite.

Be aware that with Word 3.0, using Esc-H<Enter> has the curious effect of converting the background color in the window to black. Unless you are using a black background, the Library Run command is still the preferred route for using SideKick with Word 3.0. Also, I was unable to reproduce the problem with Reflex 1.1 using SideKick 1.56a.

—M. David Stone

dBASE DATA CHECK

Validating data input by users—verifying that an abbreviation for a state is correct or that codes entered by the user will look up successfully in related files, for example—is vastly simplified if you use *Clipper's* User Defined Function (UDF) capability.

The **FUNCTION Lookup** shown in Figure 1 will validate successful lookup in any open lookup file. To make the **Lookup()** function generic, two parameters must be passed when it is invoked: the name of the variable being checked and the lookup file's workspace letter. Naturally, the lookup file must be indexed on the field (or memvar or expression) being checked. The syntax is

```
. @ row,col SAY "<prompt>" GET <code>;  
VALID lookup(<code>,<area>)
```

Suppose, for instance, that you want to

verify correct two-digit state abbreviations. Your state database, indexed on the two-digit abbreviation, is open in workspace "B". You would enter

```
. @ row,col SAY "Enter State:" GET state;  
PICT "!!" VALID lookup(st,"B")
```

When the user enters data in this field, **Lookup()** **SELECTs** Area B, **SEEKs** the entry, re**SELECTs** the original workspace, and returns T. or F. to the **VALID** function. If **FOUND()**, data entry proceeds uninterrupted. But if the user enters "WO" for Wyoming, **VALID Lookup** (state, "B") is False, and data entry will halt until the user enters a **VALID** abbreviation (one which successfully looks up in your state file).

```
FUNCTION Lookup  
PRty <code>,<area>  
PARA <code>,<area>  
***  
OUTSTRT=VALIAS()  
OK=.T.  
SELE <area>  
SET EXACT ON  
SEEK <code>  
SET EXACT OFF  
IF EOF()  
OK=.F.  
?? CHK(?)  
@ ROW(1),COL(1)+2 SAY <code>? NOT VALID?  
ENDIF  
SELE <OUTSTRT>  
RETURN OK
```

Figure 1: The *Clipper Lookup()* function validates successful lookup in a related file.

The usefulness of this function becomes more apparent when a whole bank of GETs are issued. **Lookup()** validation takes place in real time, without waiting until all the GETs have been keyed and then going back.

Notice also how **Lookup()** automatically positions the secondary file in relation to the current main record. Since the main record has been **VALIDated**, the secondary file can be accessed directly in later code (below the **READ**) to provide confirmation or other data if desired.

For example, **DISP B->stname** would display "Michigan" when the user enters "MI". This could prevent an error, should the keyer think that MI stands for Mississippi, Missouri, or Minnesota. Confirmation would be even more important if **Lookup()** is working on a coded parts or customer list.

To provide confirmation directly in

Lookup(), pass a third parameter: the field-name or expression to display. The **VALID** statement becomes

```
VALID Lookup(st,"B",stname)
```

Then, before the **ENDIF**, insert

```
ELSE  
@ ROW(1),COL(1)+2 SAY <stname>
```

Without *Clipper*, such vital validation procedures as these would be difficult at best.

David Sampson
Escondido, California

*I've taken the liberty of shortening Mr. Sampson's powerful **Lookup()** function to its most generic form. I've also substituted **EOF()** for **.NOT. FOUND()**, which has been known to misfire. His letter adds two more valuable ideas:*

*First, if the user's entry does not **FIND**, you could add code to list the possible correct entries. To do this, pass additional parameter(s) so the function knows which field(s) to list.*

*Second, consider using **Lookup()** for batch processing. Suppose you have a massive inventory database and need to update its transactions based on a disk just received from a field branch, for example. Code for updating the main file is much simplified (and runs faster) by branching the program, based on the immediate **True/False** value of **Lookup()**.*

*Some people find that the ability to create UDFs makes *Clipper* their first choice for database programming.*—Brad Stark

Craig L. Stark is senior editor for technical columns of PC Magazine. Brad Stark is a dBASE programmer and consultant based in Scituate, Massachusetts. M. David Stone is a contributing editor of PC Magazine.

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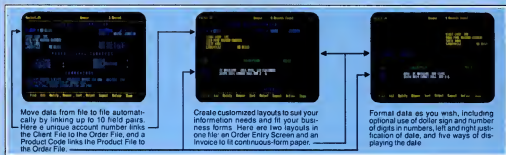
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LANGUAGES

A Turbo Pascal function that tests for a file's existence; using QuickBASIC's INT86 function to read a disk label; speedy Turbo Pascal global-find-and-replace.

QUICKBASIC

READING DISK LABELS

One of the many advantages of QuickBASIC is its ability to make DOS or BIOS calls from within a BASIC program. To do this, the assembly language routine INT86 (supplied with QuickBASIC) must either be linked to your main program or be in a user library. As an example, I have created the subprogram shown in Figure 1 to return the volume label on a disk in any drive. GetVolume is called by specifying a drive letter and a string that is to receive the label name.

INT86 uses two arrays to reference the processor's registers (AX, BX, CX, and so on). InArray is used to put values into the registers prior to the DOS or BIOS call,

and OutArray contains the table of values returned after the call is completed.

The first INT86 call establishes a 43-byte disk transfer area in BUF\$, where the volume label (and other information) will be placed by DOS. The QuickBASIC SADD (String ADDRESS) function is used to put the address of BUF\$ into the DX register. We must then tell DOS to search for the label and place it into BUF\$.

Every file on a disk has an attribute, and a volume label is simply a zero-length file with an attribute of 8. The DOS function for finding the first occurrence of a file is function &H4E. Therefore, the next step is to call this function with DX pointing to the search spec, which in this case is the drive letter plus "*.*". If the call was unsuccessful, DOS will return an error

code in the AX register. Finally, the volume label is extracted from the DTA, up to the zero byte DOS uses to mark the end.

Howard Silver
Skokie, Illinois

Because of a bug in the DOS 2.x FIND NEXT service that fails when searching for disk labels, this routine is strictly for DOS 3.0 and later. The QuickBASIC INT86 function is indeed useful for simple DOS chores, though it is slightly more difficult to use than Turbo Basic's built-in Call Interrupt function, which doesn't require the extra arrays.

Note that these arrays must be integer, though they may be either Static or Dynamic. Arrays in QuickBASIC are, by default, Static; however, if they are dimen-

```

dim shared inarray(7)
dim shared outarray(7)

input "which drive? ", d$
call get.volume(d$, v$)

if v$ = "" then
    print "no volume label"
elseif len(v$) > 12 then
    print v$
else
    print "volume label is - v$"
end if

sub get.volume(drv$, vol$) static
    ax = 0 : bx = 1
    cx = 2 : dx = 3
    vol$ = ""
    buf$ = string$(43,0)
    inarray(ax) = &h1a0
    inarray(dx) = saddr(buf$)
    call int86(&h21, varptr(inarray(0)), _
    varptr(outarray(0)))

    inarray(ax) = &h4e
    inarray(dx) = saddr(drv$ + "\*.*" + chr$(8))
    inarray(cx) = 8
    call int86(&h21, varptr(inarray(0)), _
    varptr(outarray(0)))

    if outarray(ax) = 3 then
        vol$ = "Drive doesn't exist"
    exit sub
    elseif outarray(ax) = 18 then
        vol$ = "File not found"
    exit sub
    end if

    for p = 31 to 42
        temp$ = mid$(buf$, p, 1)
        if temp$ = chr$(8) then
            p = 42
        else
            if temp$ <> ".*" then
                vol$ = vol$ + temp$
            end if
        end if
    next p
end sub

```

Figure 1: Using QuickBASIC's INT86 to read the volume label from any disk.

■ LANGUAGES

sioned using a variable instead of a constant, as in

```
X = 100
Dim Array%(X)
```

they will be treated as *Dynamic*, to be created at run time. Using *ReDim* will also create *Dynamic* arrays.

In general, *Dynamic* arrays have the distinct advantage of being kept outside of *QuickBASIC*'s normal data area and thus will not impinge on the amount of string space available to a program. When interfacing with assembly language, however, *Static* arrays are much easier to access, because the assembler routine can count on their being within the default data segment. One other point worth noting is that *BASIC* operations involving *Static* arrays will be performed more quickly than with *Dynamic* arrays, since they are that much easier to locate.

In the case of *QuickBASIC*'s *INT86* routine, considerable extra code within the routine is devoted to computing both the segment and the offset of the arrays. Microsoft is to be congratulated for including the assembler source to *INT86*, since it provides a good example of determining where those arrays are located.—Ethan Winer

TURBO PASCAL

CHECKING FOR FILES

The conventional way to test for the existence of a disk file from inside a Turbo Pascal program is to use a function similar to that shown in Figure 2. Unfortunately, however, the *Reset* procedure (like most other Turbo Pascal file I/O procedures) does not recognize read-only, hidden, or system files. Thus, the function will return *FALSE* for any file that has one or more of these attributes set.

To get around this unacceptable limitation, I have written a new *Exist* function that attempts to open the file via DOS function call 3Dh (Open File). Function 3Dh will open a file with any combination of attributes. My *Exist* function, demonstrated in the program in Figure 3, will return *TRUE* for any existing disk file.

Paul A. Neumann
Denver, Colorado

```
TYPE
Name = STRING [66];

FUNCTION Exist (FileName : Name) : BOOLEAN;
VAR
  Fil : FILE;
BEGIN
  ASSIGN (Fil, FileName);      { attempt to open the file }
  {$I-}                        { with Turbo Pascal's RESET }
  RESET (File_To_Open);       { procedure }
  {$I+}
  IF (IORESULT = 0) THEN      { if there is no error, then }
  BEGIN                        { the file exists }
    CLOSE (File_To_Open);     { and we must close it }
    Exist := TRUE;
  END
  ELSE Exist := FALSE;        { otherwise, file doesn't exist }
END;
```

Figure 2: A simple function to determine if a file exists.

```
{$B+}
PROGRAM Exist_Demo;           { demonstrate Exist function }
{ based on DOS function 3Dh }
TYPE
String_66 = STRING[66];
VAR
  File_Name : String_66;
FUNCTION Exist(File_Spec : String_66) : Boolean;
CONST
  DOS = $21;                  { interrupt for DOS functions }
TYPE
  Reg_Type = RECORD CASE Integer OF
    1 : (AX, BX, CX, DX, SP, SI, DI, DS, ES, Flags : Integer);
    2 : (AL, AH, HL, EH, CL, CH, SL, SH : Byte);
  END;
VAR
  File_To_Open : STRING[67]; { 66 + 1 so we can make an }
  Regs : Reg_Type;           { ASCII string }
  Regs : Reg_Type;           { CPU register pack }
BEGIN
  File_To_Open := File_Spec+66; { make an ASCII string }
  Regs.AL := $3D;             { DOS function 3Dh - Open File }
  Regs.AH := $44;             { for read (only) access }
  Regs.DS := Seg(File_To_Open); { point to it with DS:DX }
  Regs.OH := Off(File_To_Open); { note: OHS + 8 contains length }
  Intr(DOS, Regs);            { attempt to open the file }

  IF ((Regs.Flags OR $FFF) = $FFF) THEN { if the carry flag is clear, }
  { then the file exists, the }
  { file is open, and the file }
  { handle was returned in AX }
  { copy file handle to BX, and }
  { use DOS function 3Bh to }
  { close the file }
  BEGIN
    Regs.BX := Regs.AX;
    Regs.AH := $3B;
    Intr(DOS, Regs);
    Exist := TRUE;
  END
  ELSE Exist := FALSE;        { otherwise, file doesn't exist }
END;

BEGIN
  REPEAT
    Write('Enter a filename ([d:] [path] filename.ext): ');
    ReadLn(File_Name);
    IF (Exist(File_Name)) THEN WriteLn(File_Name, ' exists')
    ELSE WriteLn(File_Name, ' does not exist');
  UNTIL (File_Name = '');
END;
```

Figure 3: An "Exist" function that works even on a read-only file.

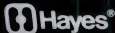
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Software Piracy is a Federal Crime

■ LANGUAGES

■ If you don't close the temporary file, you use up a file handle every time you call the function!

Astute readers will notice that the "conventional" *Exist* function of Figure 2 differs in an important way from the one in the Turbo manual. If it succeeds in opening the file, it then closes it. This can be extremely important: if you don't close the temporary file, you use up a file handle every time you call the function!

Since the rest of the Turbo file routines don't work on read-only files, you might want to use a combination of the old and

new *Exist* functions. If the new says "TRUE" and the old says "FALSE", your program could simply inform the user that the file is read-only. But if you really only want to read the file, see "Read-Only Reset" in Turbo Power User, Volume 6 Number 13.—Neil J. Rubenking

FASTER REPLACES

When you invoke the global-find-and-replace feature in Turbo Pascal, the editor shows you every replacement. This wastes a lot of your programming time if there are many replacements. However, if you hit any key, the display will freeze and Turbo will make all the remaining replacements rapidly, without displaying each of them on the screen.

Atsushi Fukuda
Urbana, Illinois

I was surprised to find out how many people don't know this little trick. I have my

fingers trained to hit the Spacebar immediately after GNU <Return> whenever I do a global-find-and-replace. It works in SideKick also, and speeds up the operation immensely.—Neil J. Rubenking

Robert L. Hummel is senior technical editor of PC Magazine. Neil J. Rubenking is a contributing editor of PC Magazine. Ethan Winer is a contributing editor of PC Magazine and owner of Crescent Software in East Norwalk, Connecticut.

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Smoothing out system transfer moves for DOS upgrades; filling out the facts about high-density FORMATS; why software publishers avoid bootable disks; and disabling PrtSc.

UPGRADING DOS VERSIONS

My hard disk system is currently running under DOS 3.0. I would like to upgrade to a later version without having to reformat the disk and reload all my files. I can copy COMMAND.COM, but have had no luck using the SYS command to transfer the two hidden files. I get the error message "Incorrect DOS version." What am I doing wrong?

Stephen E. Einson
New York, New York

This is a common problem, but, fortunately, one with an easy solution. Each new release of DOS, starting with 2.0, keeps track of its version number internally. The version number of the operating system you are currently using can be displayed using the VER command.

When a DOS command or program is executed, the first thing it does is check whether the version it's running under is the same as the version for which it was written. If the two versions are different, you get the error message "Incorrect DOS version."

In your case, you're probably booting up from your hard disk, with DOS 3.0, then trying to run the SYS program from the later DOS version off a floppy in drive A:. But because SYS belongs to the newer version, it won't run! The solution is simply to boot the PC from a floppy with the new DOS version, then execute the following commands:

```
A>SYS C:
A>COPY COMMAND.COM C:\
```

FORMATTING DISKETTES

I have a recurring problem formatting high-density disks. I nearly always get a response indicating that some of the floppy disk is unusable. A typical response would be

```
1,213,952 total bytes
268,800 bytes unavailable
945,152 available bytes
```

Running CHKDSK, however, gives a response:

```
655,360 bytes total memory
541,248 bytes free
```

Why are so many bytes unavailable? And of the available bytes, why are some "free" and others not?

Robert Trout
Encinitas, California

The FORMAT program performs two separate but linked functions. First, it writes magnetic "address" marks on the disk that DOS will later use when it reads and writes data. Second, it tries to identify sections of the disk that cannot be read or written reliably (usually because of physical damage to the diskette) and marks those as "unavailable."

It's not unusual for brand-new hard disks to have one or more defective spots. Because the percentage of bad areas to total storage capacity is usually quite small, the defects are accepted as part of the manufacturing process. During a format, these bad areas are detected by the FORMAT

program and marked to prevent their use.

Floppy disks, on the other hand, are so inexpensive to make that any defective ones should have been discarded during the manufacturing process. Floppy disks we buy in the store should thus be error-free. A properly operating disk drive, formatting quality disks, should not consistently produce the problems that you describe.

The first order of business is to determine if the culprit is the floppy drive or the diskette. Take some diskettes that you have formatted and that indicate bad areas, and reformat them on another AT with a high-density drive. If the diskettes again come out with large numbers of bad bytes, then it's probably not your machine, and you can safely suspect the diskettes. Try purchasing different brands until you find one that performs properly on your machine.

If the FORMAT problem does not repeat, then the cause of the problem is probably your disk drive. There are many things that can go wrong with a disk drive, not the least of which is dirty read/write heads. So, before you panic, try purchasing a head-cleaning kit. They're relatively inexpensive and might do the trick. If that doesn't work, however, it's off to your computer dealer to find a technician who will check and realign your drive.

*While I'm on the subject, the message from CHKDSK that you quoted in your letter refers to the amount of system memory, or RAM, that is installed in your computer. In your case this is 640K (640 * 1024 = 655,360). The amount reported as "free" is available to be used by any programs*

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■ PC TUTOR

you might run. The difference between the total memory and free memory is the amount used by DOS and any TSRs you have loaded.

BOOTABLE DISKS

Why don't the software publishers make their disks self-starting instead of requiring that the purchaser copy the DOS files and COMMAND.COM to them?

Samuel E. Beall
Knoxville, Tennessee

To place the Microsoft Disk Operating System (MS-DOS) on a distribution disk, along with its software, a software publisher must purchase a license to copy and distribute the system files and COMMAND.COM, or he'll very quickly find himself in court for software piracy. While such a license could easily be negotiated, you would, no doubt, find that the cost of the software package will have increased by the cost of MS-DOS.

A second hurdle facing the publisher is deciding which version of DOS to include on the disk. IBM has released seven versions of DOS since 2.0, and more are planned. Include the various OEM versions of MS-DOS (IBM, COMPAQ, TANDY, etc.), and you'll find yourself choosing from over 50 DOS versions. It's obviously ridiculous to expect a manufacturer to create separate products to support each particular version. The most reliable way to ensure that the version of DOS you are currently using gets onto your distribution disk is to let you do it.

The final reason is more pragmatic. As applications become larger and publishers try to fit more on each disk, there simply may be no room on the distribution disk for DOS. As of Version 3.3, the two hidden files, IBMBIO.COM and IBMDOS.COM, and COMMAND.COM total 77,566 bytes, or 21 percent of the capacity of a 360K diskette. While necessary for users of floppy-based systems, a bootable application disk has become less important as hard disks become more common.

TURNING OFF PRtSC

My partner has an IBM PC-XT connected to a network that supports printer sharing. Because all his printing is done through the network, not having a printer physically

attached isn't a problem, except when he accidentally hits Shift-PrtSc. At that point, simply put, his system locks up and he must cycle the power.

Using the MODE and SET commands, I have attempted to redirect LPT1: to the NUL device, but to no avail. I even attempted to write a machine language program to intercept keystrokes and INT 5 calls, but after a few attempts, I was forced to throw in the towel. Any suggestions?

David A. Cammack
Anaheim, California

When a key is struck, the BIOS normally translates the key into its ASCII representation and passes it along to the program that is currently running. The Shift-PrtSc key combination, however, is treated differently. In this case, the BIOS doesn't pass the key on, but treats it as a request

■ There are a few ways to disable the PrintScreen function, and here are two. The first is a brute-force method. The second is slightly more elegant.

for a screen print and issues an interrupt 5. The INT 5 service routine then takes over the task of reading the contents of the screen and sending it to the printer.

There are a few ways to disable the PrintScreen function, but I'll present just two. The first is a brute-force method that replaces the INT 5 service routine located in ROM with a one-instruction routine in RAM that passes control back to the program that was running as if nothing had happened. The second is a slightly more elegant method that I'll explain later.

To replace the PrintScreen function with a do-nothing function of our own simply requires that we change the vector for INT 5 from pointing to the ROM routine to

our routine. This can easily be accomplished by DOS interrupt 21h subfunction 25h, "Set Interrupt Vector." For our purpose, we wish to point the vector to an IRET instruction. IRET is a special form of the RET (RETurn) that is used with interrupts, like INT 5. It causes execution to pick up exactly where it was interrupted.

Figure 1 shows a short program you

BYTE VALUE	MEANING
0	Ready to print
1	Screen is being printed
FFh	Error occurred on last PrintScreen

When an INT 5 is generated, the Print-

Screen routine checks this byte to determine how to proceed. If the byte contains a 0, it is set to 1, and an attempt is made to print the screen. If the attempt is successful, the byte is reset to 0 and control re-

```

N NOINT5.COM
A 100
JMP #103 ;Jump to install
IRET
MOV DX,#102 ;New INT 5 address
MOV AX,2505 ;Set vector
INT 21 ; Thru DOS
MOV DX,#103 ;Leave this much
INT 27 ;Stay resident

R CX
10
W
Q
  
```

Figure 1: A DEBUG script, NOINT5.SCR, that will create the NOINT5.COM program.

can assemble with DEBUG that will prevent INT 5 from triggering a PrintScreen. First, create the file NOINT5.SCR using a pure-ASCII text editor, like the WordPerfect Program Editor. Be sure to hit return at the end of each line, including the blank line after the INT 27 instruction. Alternately, you could type the commands directly into DEBUG. Next, make sure DEBUG.COM is either in your current directory or in a directory listed in your PATH. You now create NOINT5.COM with the following command:

DEBUG < NOINT5.SCR

The best way to load NOINT5 is in your AUTOEXEC.BAT file, before any other memory-resident programs and before any strings are added to your environment.

While effective, NOINT5.COM does add yet another memory-resident program to your system and wastes your available RAM. There is, however, a more elegant method. The PrintScreen function maintains a byte in low memory at 0000:0500h that reflects the status of the PrintScreen function. The values posted in the byte and their meanings are shown in the following listing:

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turns to the calling program. If an error occurs, a value of FFh is placed in the byte. Programs can check this byte to see if an error occurred.

If the status byte is 1, however, indicating a PrintScreen is in progress, then the PrintScreen routine simply returns. This prevents one PrintScreen call from being interrupted by another. It also provides us with an easy way to prevent a PrintScreen from occurring. Figure 2 lists a short program that sets the status byte to 1. By doing

```
N NOPRTSC.COM
A 100
XOR AX,AX ;Point 00 to
MOV DX,AX ;low memory
MOV EAX PTR [000],01 ;Set to busy
HLT ;Return to DOS

NCR
A
M
O
```

Figure 2: NOPRTSC.SCR, a DEBUG script to create the NOPRTSC.COM program.

this, NOPRTSC.COM uses the logic already built into the BIOS PrintScreen routine to thwart further attempts to print. It has the additional benefit of not being a TSR program.

Create the DEBUG script file NOPRTSC.SCR as described previously and create the .COM file with the command:

DEBUG < NOPRTSC.SCR

Now, simply run the program to disable the PrintScreen function. Programmers can also use this technique to prevent a PrintScreen from occurring while an application is using the printer.

Robert L. Hummel is senior technical editor of PC Magazine.

ASK THE PC TUTOR

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CONNECTIVITY CLINIC



Grounding LAN cables; choosing between the INT 2Ah functions and the INT 5Ch service as an interface to network functions through PC LAN; COMMAND.COM on network stations.

WATERPIPE GROUND REVISITED

In Volume 6 Number 15, we ran a letter from Mr. Roy Colglazier expressing his concern over advice we gave on grounding a LAN cable to a cold water pipe. Mr. Colglazier advised against this practice, and after independent inquiries, we said we didn't understand his point.

One of our readers, Thomas J. Forbes, sent a letter clearly explaining the potentially hazardous situation if LAN cables are directly grounded to certain kinds of pipes and certain other conditions exist. Please read and heed.

I think the people you consulted made the assumption that the cold water pipe was bonded to the main wiring system. However, Mr. Colglazier's point was that you should never ground to anything "not directly bonded to the main grounding system that is part of the power distribution wiring."

There are several common ways this could occur. One example is using a three-prong to two-prong "cheater" adapter to fit a modern plug into old-style receptacles. If the short green wire from the adapter is not properly terminated and a coax shield or other grounding point of the equipment is connected to a cold water point not bonded to the building bond point, the building circuit breaker might not operate properly.

Another example is when a piece of equipment with two-wire cord is used. If there is an internal short to ground and the equipment is grounded to an unbonded water pipe, then the equipment circuit

breaker or fuse might not open. This could also place a lethal voltage on the equipment case.

I believe the incorrect use of three-conductor to two-conductor AC adapters is probably the most common cause of electrical accidents and fires. Don't ground anything to cold water pipes if you aren't certain of their bonding to the electrical system's ground.

Thomas J. Forbes
Palmdale, California

NETBIOS PROGRAMMING

I enjoy reading Connectivity Clinic, especially when you include programs like SRVCLOCK and NETCLOCK (PC Magazine, Volume 6 Number 14). These are great examples of programming for NETBIOS, and I encourage you to print more of them. I assembled the listings and run the pair on a Token-Ring Network under the PC Local Area Network Program.

■ The incorrect use of three-conductor to two-conductor AC adapters is probably the most common cause of electrical accidents.

I just started writing application-to-application communications programs for NETBIOS and hope you can answer a few questions. In the SRVCLOCK and NETCLOCK examples, I discovered that the PC LAN program has to be started (i.e., NET START) in order for the programs to work. If the NETBIOS code (NETBEUI, Version 1.0) is already loaded, why must PC LAN be run?

I've been told that it is a good practice to avoid using the INT 5Ch NETBIOS and to use the INT 2Ah (0400h—Execute NETBIOS) interface instead. Why would this be so?

Tom Cervenka
Berwyn, Illinois

The technical reference for the IBM Token-Ring describes a function call to initialize the NETBIOS interface. SRVCLOCK and NETCLOCK should work without first running the PC LAN program by adding this function call to each program, but we haven't tried it. Note that this initialization of NETBIOS is likely to conflict with the PC LAN program. Don't include it when PC LAN will be or has been active. Note also that this is a Token-Ring function, not a NETBIOS function, and it probably isn't available in other NETBIOS-compatible environments. The INT 2Ah functions are recommended by IBM as a higher-level interface to network functions, including NETBIOS functions, through PC LAN. This recommendation is IBM's commitment to preserve that interface in future products. Using INT 5Ch is the "classic" and common

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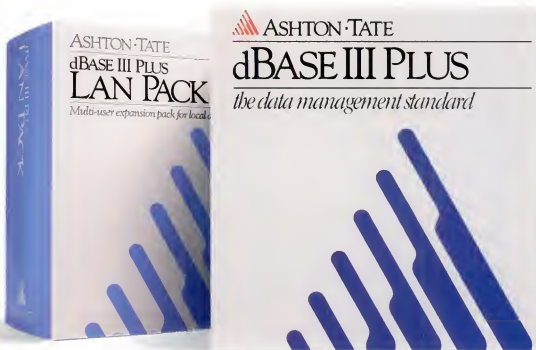
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■ CONNECTIVITY CLINIC

way of entering NETBIOS, and it is unlikely that anyone will abandon INT 5Ch service. The INT 5Ch interface is used in other IBM products. There is therefore no obvious benefit to INT 2Ah over INT 5Ch,

while there are some benefits to choosing the INT 5Ch interface. The INT 2Ah interface is provided by PC LAN. If you aren't running under PC LAN, other vendors' network operating systems might not sup-

port it. Where PC LAN is used, INT 2Ah is available only when PC LAN is active. Also, there is some slight overhead incurred when using INT 2Ah calls because the operating system must determine which INT 2Ah function was requested and then call INT 5Ch.

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Jerry Pournelle
Byte Magazine, July 1987

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■ The INT 2Ah functions are recommended by IBM as a higher-level interface to network functions, including NETBIOS, through PC LAN.

issued: `COMMAND = D:\COMMAND.COM /P`. The server is the D: drive. This causes a copy of COMMAND.COM on the file server's shared directory to be invoked. The /P parameter causes all future reloads of COMMAND.COM to come from the file server. An added benefit is that when COMMAND.COM is invoked from the file server, it runs any AUTOEXEC.BAT file it finds. This lets us put one AUTOEXEC.BAT file on the boot disk and one on the file server's shared directory. Commands related to paths, sign-on messages, and other network features can be easily updated.

Jim Pison
Athens, Georgia

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■ CONNECTIVITY CLINIC

■ To set a path DOS will use to find COMMAND.COM, we suggest you put a SHELL statement in the CONFIG.SYS file of every station.

telling DOS to make it permanent with the /P switch. You can prove this by noting the loss of another 4 to 5K of RAM for the second copy.

If you really want to set a path that DOS will use to find COMMAND.COM, we suggest you put the following SHELL statement in the CONFIG.SYS file of every station (hit Return after /P):

SHELL=A:\COMMAND.COM
D:COMMAND.COM /P

The second drive, path, and filename tell DOS where to look for the transient portion of COMMAND.COM. This can be any network drive or subdirectory. This entry automatically sets the COMP-SPEC= parameter in the environment. It permanently and flexibly does everything you want, but it works only with DOS 3.0 and later versions.

Frank J. Derfler, Jr., is a contributing editor of PC Magazine.

NETWORK YOUR QUESTIONS

Connectivity Clinic gives you practical solutions to networking problems of all types. We'll pay \$50 or more for any tips we print, plus an extra \$25 if you submit your letter on a disk, and we'll gladly answer any questions you have, at no charge. We're sorry, but we're unable to answer letters personally.

Mail your contributions to Connectivity Clinic, PC Magazine, One Park Avenue, New York, NY 10016, or you may contact Frank J. Derfler, Jr., via MCI Mail (be sure to use Derfler's box named CONNECTIVITY CLINIC).

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CIRCLE 155 ON READER SERVICE CARD

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FTC rules say:

1. The Seller must ship your order within 30 days of receiving it, unless the advertisement clearly states it'll take longer.
2. If it appears that your order will not be shipped when promised, the Seller must notify you in writing in advance of the promised date, giving a definite new date, if known, and offering you the opportunity to cancel the order with a refund or consent to a definite delayed shipping date or an indefinite delay.
3. The Seller's notice must contain a stamped self-addressed card or envelope with which you can indicate your preference. If you don't respond to this notice, the Seller may assume you agree to the delay, but must either ship or cancel your order within 30 days after the original

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Note the time and date of your conversation and the name of the person you talk with;

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3. If you think the merchandise is defective, reread your product instructions and your warranty carefully to be sure you don't expect features or performance the product isn't designed to give. Then contact the Seller for instructions. Don't return it to the Seller until you have been instructed to do so.
4. When returning merchandise make sure you keep the shipper's receipt or packing slip; your right to be reimbursed for postal cost is determined by store policy.
5. If you have completely discussed your problem with the Seller and are still not satisfied, write to the consumer complaint agency in the Seller's state. If you paid for the merchandise by credit card, you may have rights to withhold payment under a Federal law called the Fair Credit Billing Act.

PC Magazine's Direct Marketing Connection

For PC Products and Services

For many of you, mail order is your primary means of purchasing PC products and services.

In fact, in recent interviews with our subscribers, we learned that 70% bought PC products and services through direct marketing channels during the past year.*

You buy direct because it's convenient, because you know exactly what you want and don't need any hand-holding.



The following special section, PC Magazine's Direct Marketing Connection, is what you've been demanding. It connects you with the direct marketers who are anxious to please you. By having them all in one place, you can quickly zero in on the products you need from the vendors you want to buy through.

*Starch Study, July 1986

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Jameco's new IBM PC/XT/AT compatible kits include everything you need to assemble a working computer and come with complete step-by-step assembly instructions. Plus... Free! Quicksoft PC Write Word-Processing Software.

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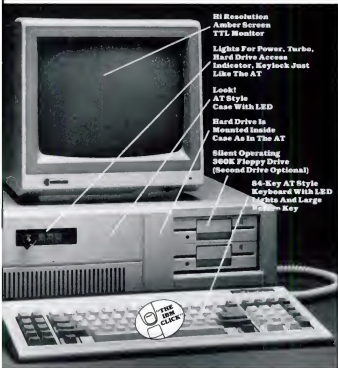
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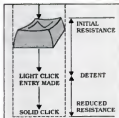


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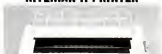
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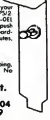
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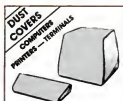
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COMING UP

LOW-COST CADD SOFTWARE Can CADD programs that sell for under \$500 offer flexibility and functionality similar to that of the de facto CADD standard, *AutoCAD*? Vendors in the burgeoning low-cost CADD market claim that their products can indeed give you all the CADD capabilities you'll need at a fraction of *AutoCAD*'s price. To test that claim, our reviewers put these 16 low-priced contenders (including 3 programs that offer 3-D capabilities) through a grueling series of tests to determine just how well they measure up against the industry standard.

HARD DISKS TO GO You can now get that most powerful of peripherals, a hard disk, at bargain prices. For instance, mail-order houses offer a convenient, cost-efficient, and surprisingly low-risk way to obtain fixed-disk storage units. Of course, shopping by mail requires some preparation on your part, and reviewer Walt Rowinsky gives you advice on just how to research the mail-order marketplace before you buy. Users whose tastes run more toward the easy-to-install hard disk cards will find that not only are the new ones no longer burdened by notoriously slow access times and meager storage capacities, but they sport lower prices on a par with conventional hard disk systems. Winn L. Rosch reviews 15 of these cards.

PACKAGED COMPUTERS Those who favor desk space over expansion board space or who want to use a computer without the fuss of learning about hardware would do well to investigate one of the five small-footprint machines reviewed here. The Acer 710, Cordata WPC, IBM PS/2 Model 25, Vendex Turbo-888-XT, and Zenith eaZy pc are perfect for the user who wants prepackaged, no-pain computing right out of the box.

ACCOUNTING Our team from Price Waterhouse takes a look at the *SouthWare Business Series*, an integrated accounting package that should appeal to the business owner and accountant alike. Able to run on PCs, LANs, and minicomputers, it is flexible enough to grow with your business. ☐

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p. ☐ Linked to mini
q. ☐ Networked together

6. Does your company own

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s. ☐ Mini(s)

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u. ☐ In 4 to 6 months
v. ☐ In 6 to 12 months
w. ☐ No definite plans

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801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850
851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900

1. In which of the following sectors does your organization operate? (Check one.)

- a. ☐ Private Industry
b. ☐ Government
c. ☐ Education

2. Your primary job function is (check one):

- d. ☐ MIS/DPE Communications Systems, Programming
e. ☐ Engineering/R&D
f. ☐ Financial/Accounting
g. ☐ Marketing/Sales
h. ☐ Administrative/General Management

3. Is your company a reseller?

- i. ☐ Yes
j. ☐ No

4. For how many IBM PCs and compatibles do you buy products?

- k. ☐ 10 or less
l. ☐ 11-25
m. ☐ 26-100
n. ☐ 100 or more

5. Are PCs in your office

- o. ☐ Linked to mainframe
p. ☐ Linked to mini
q. ☐ Networked together

6. Does your company own

- r. ☐ Mainframe(s)
s. ☐ Mini(s)

7. Do you plan to buy

- t. ☐ None
u. ☐ In 4 to 6 months
v. ☐ In 6 to 12 months
w. ☐ No definite plans

8. Number of employees in your company:

- x. ☐ 25 or less
y. ☐ 26-99
z. ☐ 100-499
1. ☐ 500-999
2. ☐ 1000 or more

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AFTER HOURS

ART & LEISURE

PC-Life: A Vision of the Future

BY JONATHAN MATZKIN

We're about as close to the bookless society as we are to the paperless office, but magazines like *PC-Life*, from Microstar Graphics, are definitely a vision of the future. Even if they don't threaten your favorite tabloid yet, disk-based publications offer possibilities that just don't exist on paper.

PC-Life is published bimonthly (or thereabouts) and distributed on 5¼-inch floppy disks, like software. Graphically and editorially sophisticated, it is easily the slickest publication currently on disk.

Unlike its competitors, *PC-Life* has a highly recognizable graphic image. That visual signature is courtesy of *Show Partner*, a presentation graphics and animation program from Brightbill-Roberts. *Show Partner* is the shell that knits *PC-Life* together and provides the visuals that separate it both from other diskmags and from the conventional press.

Titles are scrolled or wiped in, often accompanied by starbursts or other appealing embellishments. Illustrations are ani-

mated and fade in and out in a variety of innovative, eye-catching styles.

Even the text of articles is graphic. It scrolls across the screen, sort of like at the beginning of *Star Wars*.

PC-Life's graphic image is recognizable enough to have inspired a full-fledged parody in Issue 6 of *Big Blue Disk*, a competing diskmag.

Because *PC-Life* is PC based, it interacts with its readers. Each issue includes a game, though these haven't been up to the high graphics standard of the rest of the magazine.

Issue 2's *Sea Wolf* plays much like the arcade game it is named for, but it's crude and uninteresting. A trivia quiz in Volume 2, Issue 1, is better, offering questions on topics from the Beatles to presidents of the United States.

Letters to the editor are also interactive, via a simple text editor in each issue that readers use to fire off opinions.

PC-Life's articles are always related to microcomputers in some way, but the editors have managed to introduce considerable variety. There are equipment reviews, stories about developing technologies like CD-ROM, and free utilities from *PC Magazine*.

The most interesting running feature has been a series of cover story interviews about well-known people and how they use

Like many magazines aimed at a broad audience, each issue of PC-Life features an interview with a popular personality.

INTERVIEW ISAAC ASIMOV



Q: How many books is it now?

R: Well, let's see. In July I had two books published: "The Best Science Fiction of Isaac Asimov." This October will see the fifth in my Foundation series, "Robot Dreams." I will have a collection published called, "As Far As The Human Eye Can See." I'm also working on the sequel to "Concentric Universes."

their personal computers.

In Issue 2, Isaac Asimov discusses topics ranging from his work and work habits to the Strategic Defense Initiative and U.S.-Soviet scientific exchange.

Timothy Leary, the sixties drug guru and social theorist, talks about his current software in Volume 2, Issue 1. Traces of his counterculture past creep through comments about computers and current trends in technology.

A truly fascinating piece called "Cuomo's PCs" in Volume 2, Issue 1 describes the growth of PC use in New York State Government. The story details the usual administrative and hardware problems that crop up when large agencies adopt microcomputers, but that's just the beginning.

As any seasoned Albany watcher will tell you, state politics in New York is rarely statesmanlike and always political. "Cuomo's PCs" details a Byzantine approach to PC allocation by party and patronage. It's a bit sad, but good reading.

I would like to have seen more of both the Asimov and Leary interviews. That points up one of *PC-Life's* inherent problems: the limited space available on standard 360K-byte floppy disks demands brevity.

But space constraints aren't always a drawback. While some

articles seem short or superficial, others probably benefit from the necessary concision.

PC-Life has appeared on a somewhat erratic basis until now, though its editors promise to adhere to a bimonthly schedule in the future. That would increase the publication's credibility as a serious periodical and discourage perceptions of *PC-Life* as a mere novelty.

Timeliness would also make the magazine's product reviews more credible and useful. Volume 2, Issue 1 offers reviews of the Plus Hardcard and Revolution Software's *Cruise Control*, a cursor utility. Both products were widely reviewed in computer publications a year ago, and there's now a Hardcard twice the size of the model *PC-Life* reviewed.

It's not serious competition for print media, but that doesn't mean *PC-Life* isn't a credible magazine on its own, still-evolving terms. And it may be the most fun and information you'll ever get out of your PC for only \$7.95. At that price, the spectacular graphics alone make it worthwhile.

List Price: *PC-Life*, \$7.95.
Requires: 256K RAM; CGA, EGA, or Hercules graphics adapter and monitor; DOS 2.1 or later. Not copy protected. Microstar Graphics Ltd., 1201 E. Fayette St., Syracuse, NY 13210; (315) 472-0345.

CIRCLE 679 ON READER SERVICE CARD

Cuomo's PCs

How PCs are being used in New York State Government

(Pgs. 20)

Most *PC-Life* features look at topics related to PC use; this story covered where and how New York State uses personal computers.

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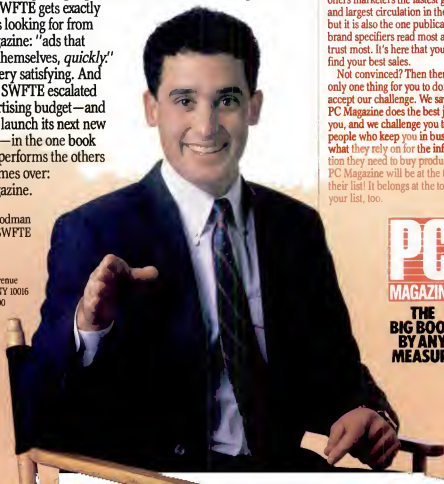
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AFTER HOURS

Personal Finance

(continued)

Price updating is an important feature for all of the portfolio managers, since that is what you'll be doing most often. *Managing Your Money* has the fastest and easiest manual procedures: with a newspaper and a few keystrokes you can update all the prices in your portfolio. Or for \$150 (\$79.97 to registered *Managing Your Money* owners), you can purchase companion program, *Managing the Market*, that automatically dials up the Dow Jones News/Retrieval and collects your quotes. *

Managing Your Money is the only copy-protected program in the group, but the protection, like fashionable beer, is "lite." At random intervals, possibly as long as several months, the program will ask you to insert the key disk in drive A:

For the Dabbler

The portfolio manager in *Dollars & Sense*, from Monogram Software, has fewer capabilities than those of the other two programs, but it may be all the small investor needs.

You move around the program by entering a letter beside menu items. Data input is straightforward and will cause little trouble, although the program makes no distinction

among mutual funds, common stocks, bonds, and options. The rather limited output—just three reports—is geared toward tax schedules: Dividends & Interest (Schedule B), Capital Gains (Schedule D), and a current holdings inventory. *Dollars & Sense*'s most grievous shortcoming is that it doesn't calculate the capital gains holding period. The other two programs automatically shift an investment from short- to long-term when the appropriate period has elapsed, but you must do this manually with *Dollars & Sense*.

There are no graphs, comparisons, or other analyses, so you can't use *Dollars & Sense* to learn if you are overinvested in one area or what percent of your portfolio is tied up in high Beta stocks. *Dollars & Sense* is not a tool for studying your portfolio; rather, it is an inventory/archival program designed to record purchases and sales and report the results.

Third in Sylvia's Series

Sylvia Porter's *Personal Investment Manager*, from Time-works, is the new kid on the block and obviously aimed at *Managing Your Money*, the longtime market leader. Both feature a best-selling author as their guiding light, but there are few other similarities. *Managing Your Money* integrates personal finance, tax planning, and investment tracking in the same

Printin Progress: Split 72 man and split 100ms GAT Fortified					
Date Date: 08/25/97					
Description	Symbol	Price	Vol	Change	Percent
Intl Cap. RF	CHKA	9.5700	00/25/97	4.8700	1.70
erica	BIT	15.8800	00/25/97	0.0000	0.00
WT	W	35.1250	00/25/97	+0.5000	1.40
all South	BLZ	41	00/25/97	-0.2500	20
ort World coll	WJ3	3.7000		0	30
ville Salings	PAC	46.1250	00/25/97	43	70

Sylvia Porter's Personal Investment Manager is the only one of these three with a communications link for stock price updates.

program; Sylvia Porter's series consists of a separate program for each of the three functions.

Personal Investment Manager uses the pull-down-menu, point-and-shoot approach to navigation around the program. While this works very well, the same careful attention is not evident in the design of the input screens. Entering stock transactions is clumsy, and manually updating quotes is a downright awkward process involving several function keys for each update. On the positive side, you may never have to manually update prices—**Personal Investment Manager** is the only software that includes the code to dial Dow Jones. And it may be prudent to do so if you invest heavily: the cost for updating, say, stocks in non-prime-time hours is typically about 50 cents.

Personal Investment Manager excels in its number of preformatted reports: open holdings, transaction summary, interest, dividend, gain/loss, return on investment, cross indexing, and price history. A report writer feature allows you to design custom reports, and a full series of graphs, like those in *Managing Your Money*, gives you a picture of how your investments are doing. The user manual is informative and complete.

If you make just a few transactions a year, then *Dollars &*

Sense may make sense for you, but if you are an active, aggressive investor, then you will surely need either *Andrew Tobias's Managing Your Money* or *Sylvia Porter's Personal Investment Manager*. The choice should depend on whether you want a completely integrated personal financial system (in which case you should choose *Managing Your Money*) or a standalone portfolio manager (then go with *Personal Investment Manager*).

List Price: Andrew Tobias' *Managing Your Money*, Version 3.0, \$219.95; annual update, \$49.95. **Requires:** 256K RAM, two disk drives, DOS 2.1 or later. Copy protected. MECA, 285 Riverside Ave., Westport, CT 06880; (203) 222-9150.

CIRCLE 643 ON READER SERVICE CARD

List Price: *Dollars & Sense*, Version 3.0, \$179.95. **Requires:** 256K RAM, one disk drive, DOS 2.1 or later. Not copy protected. Monogram Software, 367 Van Ness Way, Torrance, CA 90501; (213) 533-5120.

CIRCLE 604 ON READER SERVICE CARD

List Price: *Sylvia Porter's Personal Investment Manager*, \$149.95. **Requires:** 512K RAM, one disk drive, DOS 2.1 or later. Not copy protected. **Timeworks**, 444 Lake Cook Rd., Deerfield, IL 60015; (312) 948-9200.

CIRCLE 682 ON READER SERVICE CARD

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BIT	B	BITCOIN	35.0000		10/23/17	
BLI	B	BILL BROWN	43.0000		10/23/17	
CHCK	C	CHALK CAPITAL	9.5700		10/23/17	
CHCK	C	CHALK INC SEC CALL			10/23/17	
CHC	C	CHALK SEC CALL	45.0000		10/23/17	
CHC	C	CHALK SEC CALL	20.1200		10/23/17	

Symbol: CHCK Type: N Security Name: CHALK CAPITAL

Last Price (USD): 9.5700 High: 9.5700 Low:

Date of Last Update: 10/23/17

Dollars & Sense offers basic investment tracking tools and little help for analysis of your position.

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The Database portion of the program offers the following information for each of the 177 countries—

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- Health statistics
- Age distribution
- Political parties
- Government leaders
- Major industries & agricultural products
- Imports & exports
- GDP trends
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- And much more!

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PC-GLOBE contains six diskettes and runs on IBM®-PC/XT/AT or compatible computers with two floppy drives or one floppy drive and a hard disk. The program works with DOS versions 2.0 or later and requires 256K RAM and a color graphics board.

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AFTER HOURS



PERSONAL FINANCE

Taking Stock of the Top Three Portfolio Managers

BY DONALD TRIVETTE

With the stock market setting new records every day, it's more important than ever to keep a close watch on your investments. If paper, pencil, calculator, and newspaper are the tools of your money management, then it's time to look at something more sophisticated. Andrew Tobias' *Managing Your Money and Dollars &*

AFTER HOURS INDEX

Andrew Tobias' *Managing Your Money, Dollars & Sense*; and Sylvia Porter's *Personal Investment Manager*
How well do the top personal financial managers track investments?

Gettysburg: The Turning Point
Civil War action

Mr. Boston Official Micro Bartender's Guide
A flair for the exotic

PC-Life
A slick disk magazine

Sense have been the two leading portfolio management programs for the IBM PC family; a third that's just out, *Sylvia Porter's Personal Investment Manager*, is sure to attract a lot of attention.

Managing Your Money and *Dollars & Sense* are compre-

hensive, integrated financial management systems with checkbook, budgeting, and planning capabilities as well as portfolio managers. Updating the price of your stock in *Managing Your Money*, for example, also updates your personal financial statement in another part of the program. *Sylvia Porter's Investment Manager* is not part of an integrated package, but it can share certain files with the two other programs in the Sylvia Porter series: *Swiftax* and *Personal Financial Planner*.

The three portfolio managers have some common characteristics. All allow you to enter information on your stocks, bonds, and other investments; update their prices; track their dividends; and report their gains and losses. Each program can also handle multiple portfolios and can store more transactions than an unethical broker with carte blanche would be able to churn out.

Advice from Tobias

Andrew Tobias' Managing Your Money, from MECA, relies almost entirely on function keys to move from menu to menu. The contextual help screens are the best anywhere, and the new 200-page manual goes a long way toward answering the criticism that earlier versions lacked sufficient paper documentation. One of the program's real strengths is a newsletter that Tobias writes quarterly with tips on using the program and personal money management. The program has a unique update policy: a

Symbol	Name	Latest Price	Yield	Special Code
ATF	American	95.750	5.6%	
BLD	Bell South	43.880		
CWZ	Williams-Sonoma	9.570	2.2%	
WGL	Westinghouse	2.500		
PRC	Pacific Telephone	9.880	1.4%	
V	Vanguard	10.150	1.2%	

Latest average for Dow Jones (for other index you track) 3018.40

Use the keys below to adjust prices of each asset while course loads to 11:
 <←/→ <←/→ <←/→ <←/→ <←/→ <←/→ <←/→ <←/→ <←/→ <←/→
 F1 - Apply all updates to all portfolios F2 - Update only the symbol that cursor is pointing to (in all portfolios)
 F3 - Change asset portfolio F4 - View all info with this symbol
 F5 - Allow updating of special codes F6 - Look at special codes
 F10 - Back up without updating Press ESCAPE for Help

Andrew Tobias' *Managing Your Money's* strong points include its integrative of stock investments in your overall worth and its ability to track market indexes.

\$49.95 annual fee gets you an update every October, complete with tax law changes, and the newsletter.

The program excels in the amount of information you can record about each transaction. In addition to the usual items like symbol, quantity, date, and price, you may record a price objective, a stop-loss level, a

risk factor, an industry group, and other items, including the value of an index—usually the Dow Jones Industrials—at the time of purchase. Because the program allows you to sort and display this information in various ways, you can quickly see if an investment has outperformed its associated index, or if you have too many high-risk stocks.

Personal Finance Software:
Summary of Features

(Products listed in ascending price order)

	Sylvia Porter's Personal Investment Manager	Dollars & Sense	Andrew Tobias' Managing Your Money
List price	\$149	\$180	\$220
Copy protected	○	○	●
Integrated package	○	●	●
Automatic quota retrieval	●	○	○
Graphs	●	○	●
Price alerts	●	○	●
Short sales	○	○	○
Price history	●	○	○
Index comparisons	○	○	○
Tax information	●	●	●

● - Yes ○ - No

print "Merry Christmas"
end



```
#include <stdio.h>
void main()
{
    say Merry Christmas
    printf ("Merry Christmas\n");
}
```



MODEL SMALL
STACK DATA 100h

xmas db "Merry Christmas\$"

.CODE

```
start mov ax,DGROUP
      mov ds,ax
      mov ah,9
      mov dx,OFFSET xmas
      int 21h
      mov ah,4ch
      int 21h
      END start
```




```

DECLARE FUNCTION Filter$ (Txt$, FilterMask$)

' =====
' Convert a number that contains non-numeric characters to
' a clean number.
' =====
' Input a line:
line INPUT "Enter a number with commas: "A$(error 1)
' Look for only valid numeric characters (0123456789.-) in the
' input string:
CleanNum$ = Filter$(A$, "0123456789.-")
' Convert the string to a number:
PRINT "The number's value = "; VAL(CleanNum$)
END

' =====
' Takes unwanted characters out of a string by
' comparing them with a filter string containing
' only acceptable numeric characters
' =====
FUNCTION Filter$ (Txt$, FilterMask$(error 2))
(error 3) TxtLength = LEN(Txt$)
FOR I = 1 TO TxtLength
(error 4) C$ = MID$(Txt$, I, 1) ' Isolate each character in
                                ' the string.
' If the character is in the filter string, save it:
IF INSTR(FilterMask$, C$) <> 0 THEN
    Temp$ = Temp$ + C$
END IF
NEXT I
    Filter$ = Temp$
END FUNCTION

```

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But we're betting you'll enjoy a unique programming experience.

In our program, for example, Microsoft QuickBASIC 4.0's instant syntax checking will find the missing ";" (error 1) the instant you type in the line.

Of course, other BASICs will catch errors like this. Eventually. But none will catch the fact that integer variable *FilterMask* (error 2) should be a string variable.

Let alone give you the incredible ability to edit and continue. For example, you can step through the FOR loop,

go back and correct *TxtLength*'s missing "%" (error 3), then resume execution from that very statement.

Or allow you to monitor the changing value of *Temp\$* until you locate the especially subtle error number 4—the proper function call is *MID\$(Txt\$, I, 1)*—and, via our on-line help, confirm the fix by displaying *MID\$*'s syntax at the touch of a key.

What's more, at \$99, Microsoft QuickBASIC 4.0 boasts a sophisticated collection of professional features. From language extensions like records, recursion, huge arrays and true functions. To high-performance executable code that runs faster than output from the former speed champ. Our very own Microsoft QuickBASIC 3.0.

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